ANALYSIS OF ALTERNATIVE COORDINATION MECHANISMS FOR THE SASKATCHEWAN COW-CALF SECTOR

A Thesis Submitted to the College of
Graduate Studies and Research
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy
in the Department of Agricultural Economics
University of Saskatchewan
Saskatoon, Canada

By

Hemal Dharmasena Kularatna

Spring, 2000

PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a postgraduate degree from the University of Saskatchewan, I agree that the Libraries of this University may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purpose may be granted for the professor or professors who supervised my thesis work or, in their absence, by the Head of the Department or the Dean of the College in which my thesis work is done. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of Saskatchewan in any scholarly use which may be made of any material in my thesis.

Request for permission to copy or to make other use of material in this thesis in whole or part should be addressed to:

Head of the Department of Agricultural Economics
University of Saskatchewan
51 Campus Drive,
Saskatoon,
Saskatchewan, S7N 5A8
Canada

ABSTRACT

The beef industry in North America has suffered from a decline in the per capita consumption of beef. This has resulted largely from consumer substitution of chicken and pork. In comparison to beef, the broiler industry has become more technologically efficient, adopting a more vertically coordinated (integrated) structure. There is a growing realization that the beef industry is not organized to respond to changing consumer preference. The problem addressed in this study is to determine how ready are Saskatchewan cow-calf producers to accept a more coordinated beef industry, both horizontally and vertically.

The primary objective of this study was to identify prospective initiatives towards vertical and horizontal coordination of the cow-calf sector in Saskatchewan, with the aim of improving the efficiency of the beef supply chain. The study was based on primary data collected from 185 cow-calf producers in Saskatchewan through a mail survey. This study analyzes current production and marketing practices, and producers' attitudes towards different coordination mechanisms. In addition conjoint analysis was carried out to investigate how cow-calf producers trade off transaction cost variables in choosing alternative marketing channels.

The results indicate that the cow-calf sector was characterized by a large number of small-scale producers with a herd size of 50 – 100 cows. The majority of cow-calf producers (55 percent) incorporated backgrounding as part of their production operations, however, beef cattle finishing was not common and was limited primarily to operations with a cow herd size less than fifty. A minority of producers (27 percent) finishes at least some of their cattle. Beef cattle enterprises contributed significantly to producers' net family income. Approximately sixty percent of respondents received more than fifty percent of net family income from their beef cattle enterprise.

For marketing, producers tended to use an auction market and order buyer arrangements when the transaction involved large numbers of cattle. However, these two alternatives did not provide producers with a higher satisfaction than written and verbal arrangements.

A large majority of producers (81 percent) recognized that declining per capita beef consumption is a problem for the future development of the Saskatchewan beef industry. Producers were responding to this challenge by incorporating improved breeds, improved feed quality and improved veterinary care. Producers also recognized the importance of the inclusion of buyers' preferences into the beef production continuum for the future prosperity of the beef industry. The producers identified a need to develop value-based pricing schemes, an ability to trace the animal to the farm of origin, a change in grading and/or marketing system to better reflect eating quality and a system to incorporate a quality assurance scheme for the production or processing system. The producers strongly recognized the need for increased coordination. Approximately 70 percent of producers felt the need for horizontal coordination, while 77 percent of producers felt the need for vertical coordination. These results are encouraging for the development of successful 'farm to plate' partnerships in Saskatchewan.

The importance of the beef cattle enterprise to producers' net family income and the experience the producers have in beef cattle operations were found to be the most important factors supporting the move towards increased horizontal and vertical coordination.

Producers tended to view the Australian Marketlink type program as resulting in a loss of independence, requiring higher capital investment and inconvenience of third party verification compared to the program of Meat Standards Australia (MSA). However, producers tended to prefer the Marketlink approach and they saw it as being more likely to emerge in Saskatchewan in the next five years than the MSA type program. There was a willingness to incur greater costs in return for achieving what they saw as greater benefits.

Conjoint analysis indicated that producers' preferences are to produce backgrounded cattle meeting buyers' requirements and selling at auction markets.

However, producers indicated a lower preference for the nature of the transaction process implying that once cattle are produced, which meet product specifications, the place of marketing was not an important consideration for them.

Based on the results of this study, it can be concluded that Saskatchewan beef producers are prepared for a more coordinated beef industry. Considering the small to medium size beef operations in Saskatchewan direct contractual arrangements seem to be a promising marketing strategy where producers could achieve transaction cost efficiencies.

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to Dr. Gary Storey and Dr. John Spriggs, co-supervisors, for their inspiration, guidance and help, and the commitments of their valuable time and technical expertise throughout the preparation of this thesis. Both Dr. Storey and Dr. Spriggs provided me the friendship to conduct this study with a great deal of enthusiasm.

I would like to thank the rest of the members of my committee: Dr. Mobinul Huq, Dr. Peter Phillips and Dr. John McKinon, who made very useful contributions to this thesis.

My special thanks to Dr. Jill Hobbs, who served as an external examiner and made very valuable comments, suggestions and contribution to this thesis.

My sincere thanks to all the members of the faculty, staff and graduate students for their friendship and for creating an atmosphere conducive to quality learning in the Department. My special thanks to Dr. Ken Belcher, who helped me in numerous ways, especially during the preparation of this thesis.

I wish to thank Mrs. Pam Mitchell, Executive Director of the Saskatchewan Stock Growers Association, for her assistance in implementing the survey.

The financial assistance provided through a Graduate Teaching Fellowship from the College of Agriculture and the Strategic Research Project, Saskatchewan Agriculture is thankfully acknowledged. My special thanks to Mr. Derek Brewin, Professional Research Associate, who made all the necessary arrangements for me to obtain financial assistance for the field research work and the rest of my thesis work through the Strategic Research Project.

My sincere thanks to my parents, Agoris and Kirihamy, and my dear brothers and sisters, who were patience during such a long time of my stay in Canada.

Finally, sincere thanks to my dear wife, Gnanaseeli, who provided me the opportunity to come to this university and her encouragement and help, and to my dear daughter, Beshmi, and dear son, Mithum, who were a constant source of love and pleasure during our stay in Canada.

DEDICATION TO MY PARENTS – AGORIS & KIRIHAMY

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Background

The increased co-ordination of agri-food supply chains is becoming a fact of life. This has been made possible by technological advances in the production and distribution of goods and services as well as instantaneous and inexpensive global communications. It has been encouraged by liberalized international trade rules.

Over the past two decades world merchandise exports have risen from 11 percent to 18 percent of world gross domestic product while services have increased from 15 percent to 22 percent (World Bank, 1998). The agricultural sector and its policies are increasingly being influenced by international developments. The emergence of more integrated world markets and the free flow of goods and services across borders coupled with internal structural development have made agriculture more and more competitive. A changing environment with improved genetics, new domestic production relationships and potential new international or national trading rules affects the profitability of the industry. Newer concerns are emerging related to food safety, human health and the environment. Rapidly changing consumer preferences, life styles and concerns over the global environment are forcing agribusiness to become more competitive and have increased demand for convenient, further processed, diverse foods. The beef industry, however, has been slow to respond to this changing demand and has not invested in new product development at levels comparable to other competing meats such as chicken and pork. (Brester, Schroeder and Mintert, 1997).

Increased co-ordination of the supply chain is a rational business response to changes in the national and international economic environment. Major factors contributing to this have been changes in the composition of final demand, potential

supply and the growing importance of larger markets. The agri-food industry is fast changing from supply-driven to demand-driven with consumers seeking more specific products and personalized service, assurances of food safety and quality, greater diversity of product attributes, accessibility and consistency of the supply of goods and services (Kinsey and Senaur, 1997, Pinnacle Management, 1998).

Coordinated supply chains capture not only the various mechanisms of transferring administrative control to the vertically interdependent stages of production but also they capture the transaction cost efficiencies of market and other linkages in a vertical production system (Mighell and Jones, 1963). Although much of the work in this area has focused on one extreme of coordination (vertical integration), very little has been done on horizontal and vertical coordination of the supply chain.

Primary producers are typically located at just one link in the supply chain but to obtain the desired coordination it is necessary to develop close links throughout the chain. Supply chain management is concerned with developing efficient linkages between the various nodes of the supply chain from the producer through to the consumer. In this process, vertical and horizontal alliances can be important. Horizontal alliances can guarantee continuity of supply and the necessary volume to satisfy customers. The vertical alliances between collective groups at different levels in the chain give strength to the total chain. While increased coordination may lead to increase operational efficiency, the benefits of greater coordination are typically not equally distributed among all participants in the supply chain. New technological developments, especially in the areas of genetic, biotechnology, grading and quality assurance programs may promote the production of specialized agricultural goods and services rather than traditional commodities. These new development activities are also stimulating increased coordination across the supply chain while reducing both tangible and transactions costs involved in production and marketing systems. Tangible costs are the costs incurred on actual inputs such as machinery, seeds, chemicals and fertilizer. Transaction costs are the costs connected with exchange, buying and selling goods and services. Hobbs (1996a) classified transaction costs

into three main categories: (i) information costs; (ii) negotiation costs and (iii) monitoring costs. More details of these costs are discussed in chapter 4.

The rapidly changing national and international environment provides significant opportunities but also threats to the Canadian economy and in particular to the Saskatchewan agri-food industry because of its heavier dependence on trade. Spriggs (1995) stated that the Saskatchewan agri-food industry is largely dependent on trade, which makes it susceptible to outside forces such as trade policies, production and price variability in other countries. This strong dependence on trade, therefore, brings risk and uncertainty to the agri-food industry in Saskatchewan. The substitute exchange mechanisms such as open markets, contracts, and vertical integration influence both the amount of risk from these sources as well as the distribution of risk. Sporleder (1992) summarizes the changing nature of transactions and the results arising from it:

> *"Various alternative exchange arrangements change the complex nature of transactions in regard to risk arising from different sources and influences the efficiency of the marketing system". (p. 1226).*

As discussed above, beef production and marketing also incur both tangible and transaction costs. For example, cow-calf producers try to produce calves with uniform characteristics sorting them according to colour, size and growth characteristics. Although this additional work increases the costs of doing businesses, it could affect the profitability and sustainability of the operation in the long term by creating trust and goodwill with downstream buyers and consumers. Some of the costs involved in these activities may not be directly observable but they are crucial to production and marketing decisions because of the risk involved in these activities.

One way to reduce transaction costs is to develop partnerships. The partnership can be within the same level of production (horizontal partnership) or between different levels of production (vertical partnership) or both. This provides producers with secured markets. At the same time partnerships will reduce the costs involved in transactions thus enabling to produce a product at lower costs or at least

comparable to other producers. Eventually, the partnership may increase the profitability by reducing the costs associated with transaction costs (Hobbs, 1996a).

Another alternative to reduce the marketing margin is to reduce the cost of production including costs of processing and produce a product that meets certain specifications desired by consumers. This will eventually increase the trust between sellers (producers) and buyers. For example, Meat Standards Australia, which is a new grading and trading system, requires producers to meet certain specifications enforced by the system. These specifications were developed using a consumer-testing panel and therefore the product meets the consumers needs. Only producers who meet these specifications will get a premium price for their product. Eventually this program could lead to better coordination of the production and marketing activities of the beef industry. The success of this program is, however, dependent on the producer's willingness to participate.

Consumers are becoming increasingly concerned over various food attributes that relate to health, fat and chemical residuals. They are increasingly demanding more convenience, quality (e.g. tenderness in meat) food. If this information is not transmitted effectively to primary producers, the attribute demanded by consumers will not be delivered. As a consequence, market share will be lost. Unnevehr and Brad (1993) stated that:

> *"Consumers clearly value reductions in the external fat on almost all beef table cuts and reductions in seam fat for chuck and round cuts. However, improvements in quality require transmission of price signals from the retail level to feeders. These signals have not been apparent and pricing institutions have been slow to adjust, even though the grading system for carcass yield provides an appropriate measure of quality". (p.292).*

The above quotation clearly indicates that producers do not get appropriate signals from the existing pricing mechanisms. Jones et al. (1992) showed that wholesale beef value differentials were not fully reflected in live cattle prices, because live cattle prices are not based on the quality of the meat. Instead, producers are paid by average market price. This inhibits communication of consumer demand to producers through the market mechanisms. This failure of the market to transfer information from the consumer to the producer and vice versa resulted in emerging

contractual arrangements in production and marketing. Producers are looking for a secured markets with higher prices while consumers are looking for more healthy, nutritious and convenient food products at reasonable prices (Royer, 1995). Barkema and Drabenstott (1995) stated:

> *"Customers throughout the food supply chain are demanding 'best product' with their preferred attributes offering benefits throughout the year over the undifferentiated goods" (p. 2).*

Streeter, Sonka and Hudson (1991) described this evolving coordination mechanism as:

> *"players at other levels in the production and marketing continuum are pressed to respond not just to the next level in the chain but also to the ultimate consumers" (p.1470).*

The stronger links between market participants enables the industry to provide the right product to markets so that the right product is supplied at the right time with consistent quality (Barkema and Drabenstott, 1995). The type of coordination between firms within the industry determines the strength of these links (McDermott and Shadbold, 1998). Newer strategies, especially in the area of biotechnology, grading and alliances, are emerging to meet evolving consumers needs. Therefore, given the failure of the market to provide the right signals from consumer to producer and vice versa, it is necessary to develop a more coordinated system in order to increase the efficiency of the current production and marketing system. Urban (1991) refers to this as industrialization by which consumers' wants and needs were fed back into a production and distribution system to provide the desired quality, availability and price.

1.2 Research Problem

The Saskatchewan beef industry has identified the highly fragmented nature of beef producers, especially the cow-calf producers, in Saskatchewan as one of the major constraints to further development of the beef industry (Brown, 1998). The future of cow-calf producers in Saskatchewan, therefore, relies on their ability to economically produce calves that provide buyers with a consistently high quality

product. In an increasingly competitive market this is quite a challenge for Saskatchewan cattle producers. A basic concern is how does a beef cattle producer develop a competitive advantage? Evolving exchange arrangements could provide a competitive advantage over rival firms and, over time could lead to entry and exit barriers (Sporleder, 1992).

Many countries such as Australia have acquired a competitive advantage by lowering their cost of production and /or increasing the value of their product, primarily through an emphasis on quality. In the past, increased quality was achieved by sorting and marketing only the best products. This was found to be inefficient and resulted in only slight price premiums for higher quality. Real quality, however, is not achieved by sorting cattle. It is a continuous process wherein poor quality products and the 'overhead costs' are systematically reduced. To achieve this goal, producers and processors in the system must have the same objectives, the same vision and the same sense of pride in what they are doing. In this respect, closer links between buyers and sellers based on mutual trust and a common commitment to quality is important.

The same principles can be applied to cow-calf producers. Cow-calf producers could reduce the costs of production by reducing the costs associated with transactions. In the traditional accounting system, these costs are ignored and are usually not quantified. What more commonly happens is that these costs are 'absorbed' into the average price paid for the product. The magnitude of these costs may puts the beef industry at a disadvantage relative to other meat industries (i.e., pork, poultry). Cow-calf producers in Saskatchewan are not immune to these costs and therefore need to develop ways to reduce the cost associated with transactions. Therefore, the continuous success of the beef industry in Saskatchewan is dependent on how successful the firms and the industries are at organizing and coordinating activities in different stages and segments of the beef supply chain to meet the changing demand at the marketplace. The success of the broiler industry in the US can be mainly attributed to its reorganization (Urban, 1991). Increased per capita consumption of chicken and a decline in the per capita consumption of beef suggests

that the problem in the beef industry may be in part a lack of close vertical coordination. This study assumes that the beef industry in Saskatchewan needs to achieve increased coordination both vertically and horizontally in order to be competitive in the national and international markets for beef.

Miller, General Manager of the Western Canadian Beef Packers, (1998) stated that the future of the Saskatchewan beef industry is dependent upon continuing to develop value-added business to complement its large traditional farm base. This can be accomplished through cooperative efforts to develop a "pasture-to-plate" system allowing more cattle to be finished within the province. Australia developed a system to incorporate small to medium size producers into the production continuum and currently it performs well. This approach incorporated consumers' tastes and preferences into the production decision (Thompson, 1998), which may be equally applicable to the Saskatchewan beef industry. Therefore, the problem to be addressed in this study is to investigate how ready are the cow-calf producers in Saskatchewan to adopt such a coordinated system and to gauge their attitudes towards different coordination mechanisms.

1.3 Research Purpose and Objectives

This study examines the current marketing practices of Saskatchewan cow-calf producers and their attitudes towards various forms of vertical coordination. The primary purpose is to identify prospective (potential) initiatives towards vertical and horizontal coordination of the cow-calf producers in Saskatchewan, which could improve the efficiency of the beef supply chain.

The specific objectives are:

(i) to investigate current organizational arrangements, which are aimed towards increased vertical and horizontal coordination of beef systems in Australia and North America;

(ii) to investigate the current production and marketing arrangements of the cow-calf sector in Saskatchewan;

(iii) to evaluate cow-calf producers' attitudes towards different vertical coordination arrangements of the type currently being practiced in Australia and elsewhere in North America;

(iv) to make recommendations to help industry formulate a working relationship between industry players to improve the efficiency of the beef supply chain.

1.4 Scope and Organization of the Thesis

Although the scope of this thesis is vertical coordination mechanisms in the beef industry, the focus is on the cow-calf sector in Saskatchewan. The other segments of the beef industry including feedlots and slaughter/processing are not specifically studied. The remainder of this thesis is organized into six chapters. Chapter two provides a profile of the beef industry in Canada and Saskatchewan. Chapter three is devoted to the study of beef quality assurance schemes in North America and Australia. Chapter four establishes the theoretical framework for the study based on the theory of transaction cost economics. The relevant literature is integrated to the theoretical framework because it enables empirical examples from the real world situations to be discussed with theory. Chapter five describes the empirical framework or research methodology adopted in the study. Chapter six presents the results and analysis of the study. Finally, chapter seven contains a summary, conclusions, policy implications and the limitations of the study.

CHAPTER 2
BEEF INDUSTRY PROFILE

2.1 Introduction

The purpose of this chapter is to provide a description of the beef industry in Canada and Saskatchewan. The chapter begins with a historical perspective of the beef cattle industry in Canada (Section 2.2). In addition, practices related to cattle production and marketing are discussed. The structure of beef industry is outlined in section 2.3. Development of Saskatchewan's beef industry is discussed in section 2.4. This provides the link to chapter 3.

2.2 Historical Perspective of the Canadian Beef Industry

The beef cattle industry plays an important role in the Canadian agricultural economy. In terms of farm cash receipts, it ranks behind wheat and canola. In 1996, cash receipts from cattle and calves represented about 18 percent of the total farm cash receipts in Canada (Saskatchewan Agriculture and Food, 1997). Brown et al., (1997a) stated that Canadian beef production represents about 2 percent of the total world's beef production. Although Canada's beef production represents a small portion of the total world beef production, beef cattle farming is an important enterprise in the Canadian agricultural economy.

In 1996, Western Canada alone contributed about 75 percent to the total gross return of cattle and calves in Canada (Table 2.1). Of 14.9 million cattle and calves in 1996, approximately 73 percent come from western Canada. Of this, approximately 40 percent come from Alberta, while Saskatchewan, Manitoba and British Columbia have 18.3, 9.1 and 5.5 percent of cattle and calves, respectively.

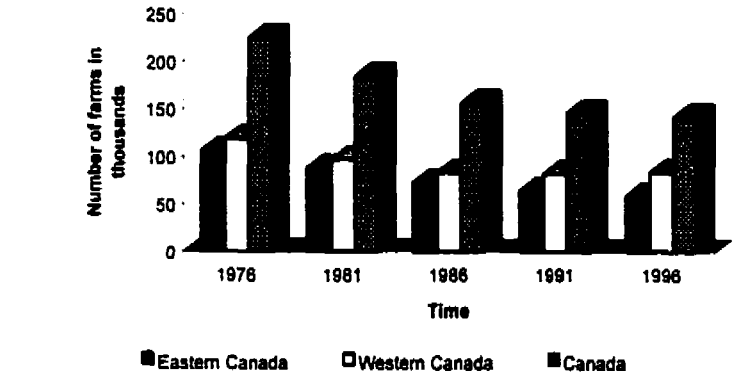
Table 2.1 Total Cattle and Calves, and Gross Return in Canada by Province, 1996

Geographic location	Total number of cattle and calves (1000)	Cattle and calves as a % of total	Gross return from cattle and calves, $ (M)	Gross return as a % of total
Eastern Canada	**4057.9**	**27.2**	**1173.5**	**25.4**
Newfoundland	8.3	0.1	1.3	0.01
Prince Edward Island	94.6	0.6	27.3	0.6
Nova Scotia	129.0	0.9	26.3	0.6
New Brunswick	100.3	0.7	23.2	0.5
Quebec	1439.7	9.7	343.0	7.4
Ontario	2286.0	15.4	752.5	16.3
Western Canada	**10835.2**	**72.8**	**3451.1**	**74.6**
Manitoba	1355.2	9.1	307.7	6.7
Saskatchewan	2723.6	18.3	636.4	13.8
Alberta	5942.3	39.9	2317.4	50.1
British Columbia	814.1	5.5	189.7	4.1
Total in Canada	**14893.0**		**4624.6**	

Source: Statistics Canada, 1997

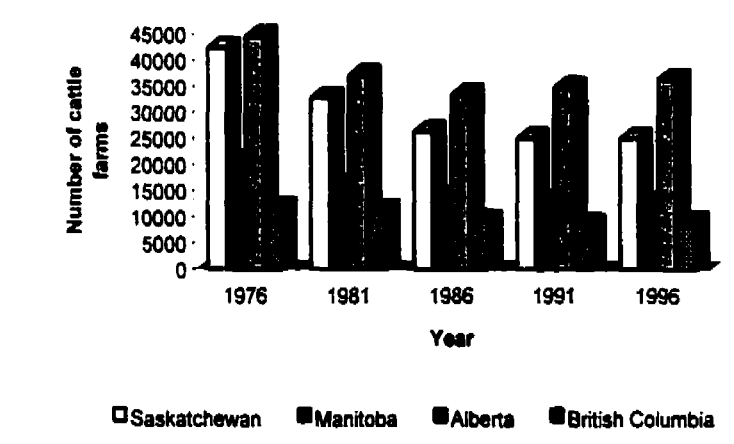
Beef cattle farms can be defined as those farms that raised cattle for the beef market. The number of farms reporting cattle and calves has declined over time (Figure 2.1). The rate of decline in the number of cattle farms in eastern Canada was greater than in western Canada. There were 1,06,144 farms in eastern Canada in 1976. This declined to 58,497 by 1996, a 45 percent decrease. The number of farms in western Canada declined only by 29 percent for the same time period. The national average decline was 37 percent. In western Canada, Saskatchewan had the largest decline of 41 percent compared to 37 percent in Manitoba, 18 percent in Alberta and 21 percent in British Columbia (Figure 2.2).

Even though the number of farms producing cattle and calves declined, the average number of cattle and calves per farm increased over time (Figure 2.3). While the number of cattle per farm increased in both western Canada and eastern Canada, the rate of increase was higher in western Canada. The average number of cattle and



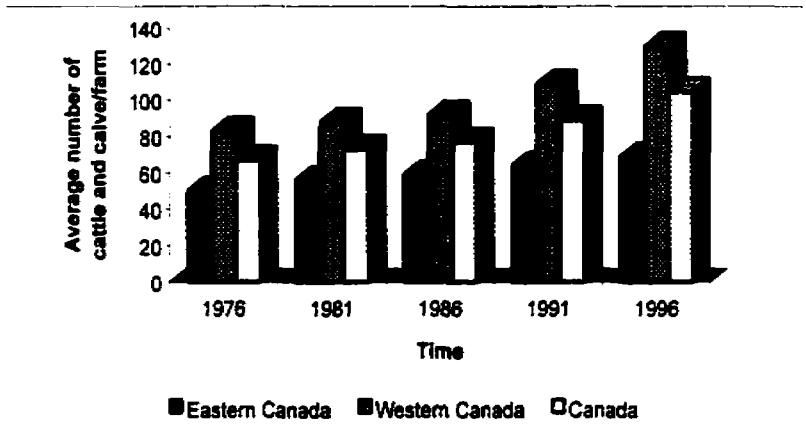
Source: Statistics Canada, 1997

Figure 2.1 Number of Beef Cattle Farms in Canada, 1976 – 1996



Source: Statistics Canada, 1997

Figure 2.2 Number of Cattle Farms in Western Canada by Province, 1976 – 1996



Source: Statistics Canada, 1997

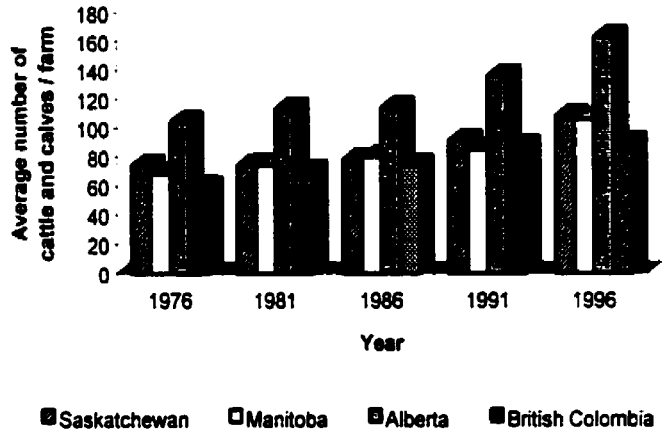
Figure 2.3 Average Number of Cattle and Calves per Farm, 1976 – 1996

calves per farm in eastern Canada was 50 in 1976. This rose to 69 by 1996, a 38 percent increase. The average number of cattle and calves per farm in western Canada was 83 and 130, respectively, for the same time period, which is a 57 percent increase. Within western Canada, Manitoba had the highest rate of increase (59 percent) compared to 46, 57 and 51 percent in Saskatchewan, Alberta and British Colombia, respectively (Figure 2.4).

Over 70 percent of the national cattle herd is located in western Canada. This can be attributed mainly to the fact that western Canada is where a large amount of feed is produced and therefore there is hardly any transportation costs associated with getting feed to the cattle. Western Canadian beef producers can, therefore, grow and deliver feed for their cattle at a lower cost. This increased availability of feed may be the reason for the expansion of feedlots in western Canada over the past few decades.

The rate of expansion of feedlots and the cattle herd in western Canada, however, further accelerated with the elimination of the Crow Benefit grain transportation subsidy in 1995. The removal of this grain transportation subsidy reduced the relative price of feed grain in the prairie provinces compared to eastern

Canada. It is expected that higher transportation costs for moving grain off the provinces will shift resources from grain to livestock production.

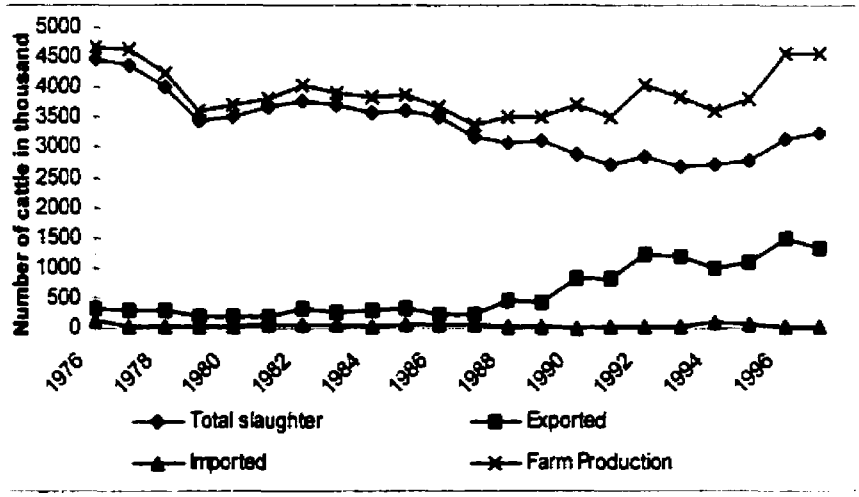


Source: Statistics Canada, 1997

Figure 2.4. Average Number of Cattle and Calves per Farm in western Canada by Province, 1976 – 1996

2.2.1 Cattle Production and Marketing in Canada

Cattle production in Canada tended to decrease during 1976 to 1988 and then gradually increased since that time (Figure 2.5). The increasing cattle numbers after 1988 can be attributed mainly to the introduction of the Canada-US Free Trade Agreement (CUSTA) in 1989 and subsequent counterpart, the North American Free Trade Agreement (NAFTA) in 1993/94. The relaxation of foreign direct investment rules under these agreements encouraged investment in western Canadian beef packing industry by large US firms. A similar pattern can also be observed for the total cattle slaughtered during the same time period. Although beef cattle exports remained stable until 1988, they tended to increase after 1988, which could also be attributed mainly to the above trade agreements. However, beef imports seem to have leveled off during this period.



Source: Statistics Canada, 1997

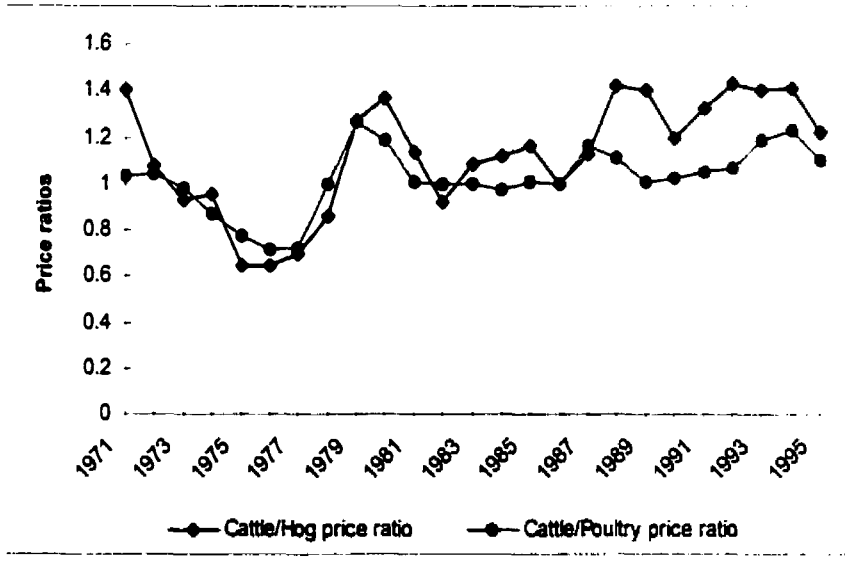
Figure 2.5 Total Cattle Slaughter, Exports, Imports and Total Farm Beef Production in Canada, 1976 - 1997

2.2.2 Relative Price of Beef

Researchers, like Brester, Schroeder and Mintert (1997), point out that reduced beef demand may intensify if efficiency gains and marketing improvements in the pork industry reduce retail pork prices and create products which have greater appeal to consumers. These authors further note that the potential for further productivity gains in the pork industry are high, attributable mainly to genetic and nutritional improvements. Similarly, the productivity increases in the poultry industry have resulted in relatively lower poultry meat prices and increased per capita consumption. This has been further stimulated by the fact that consumers generally regard beef as unhealthy because of its relatively higher fat content.

The increases in the productivity of the pork and poultry industries, coupled with the effect of vertical integration and better marketing arrangements enable these industries to lower costs of production and thereby have put pressure on the beef industry (Brester, Schroeder and Mintert, 1997). Stated differently, meat products, which do not match the productivity gains of substitute products, will be at disadvantage. Changes in relative prices among competing products help to explain

changes in consumption of those commodities. For example, an increase in the productivity of the poultry industry contributed to declines in real poultry prices, which resulted in increased poultry consumption. The decline in poultry price caused the price ratio of cattle to poultry to increase over time (Figure 2.6). The future of the beef industry will depend on its ability to manage efficiently and lower its costs of production in order to compete with substitute products. In other words, the beef industry needs to be more price competitive, either through more efficient production, processing and / or marketing arrangements.



Source: Agriculture Economic Statistics, 1996.

Figure 2.6 Cattle / Hog and Cattle / Poultry Price Ratios, Canada, 1975 – 1995

2.3 Structure of the Beef Industry

Over the last few decades, the beef industry in Canada has undergone major structural changes (Brown et al., 1997b). Prior to the 1980's, the beef industry was dominated by small mixed farm operations, which produced calves, raised them to finished weight and sold them directly to slaughtering plants. Over time, however, the beef cattle industry has divided into several sub-sectors such as cow-calf, backgrounding, finishing (feedlots), processing, wholesale and retailing sectors

(Figure 2.7). The latter two sub-sectors are now highly integrated. Each of these sectors became specialized in particular activities in the beef production chain.

The cow-calf sector consists of a cowherd that produces calves, which may be sold or backgrounded on the farm following weaning. The usual practice of cow-calf operations is to breed cows in June and July so that calves will be born in February and March of the following year (Figure 2.8) avoiding the very cold winter months of January and February. The calves nurse with their mothers on grass throughout the spring, summer and fall seasons. By October - December, calves reach about to 160 - 320 kg. depending on genetics and feeding conditions. Smaller calves (between 160 – 225 kg.) will be fed with hay for another 3 - 4 months before they are transferred to the backgrounding operation.

Backgrounding is the process of feeding calves with forage (i.e., alfalfa hay) especially to increase the weight of smaller calves. It is an intermediate stage of beef production, which is carried out by either the cow-calf operator or by individuals whose business is to specialize in feeding the smaller and medium framed weaned calves. These calves are fed with low energy feed in order to grow them without having them develop too much fat. As shown in Figure 2.8, the smaller weight calves (160 – 225 kg.) and medium weight calves (225 – 275 kg.) at weaning are normally placed on low energy feed before they enter the finishing operation. The heavier calves (275 - 320 kg.) are normally placed on a high-energy grain-feeding program (finishing operation) directly. The animal will reach approximately 360 kgs after three to five months in the backgrounding lot.

Following backgrounding, the animals move to the finishing lot on farm or they are sold to feedlot operators whose business is to intensively feed the backgrounded calves with high-energy rations. The movement of calves directly to the feedlot is another growing trend in the beef industry. Animals in this weight range gain weight quickly, around 1.4 kgs per day. In two to three months they will reach the target weight of 550 – 590 kgs. Feedlot size varies from several hundred animals to 40,000 animals on feed at one time (Canadian Beef Export Federation, 1998). Once the feedlot owners purchase feeder cattle from either cow-calf operators

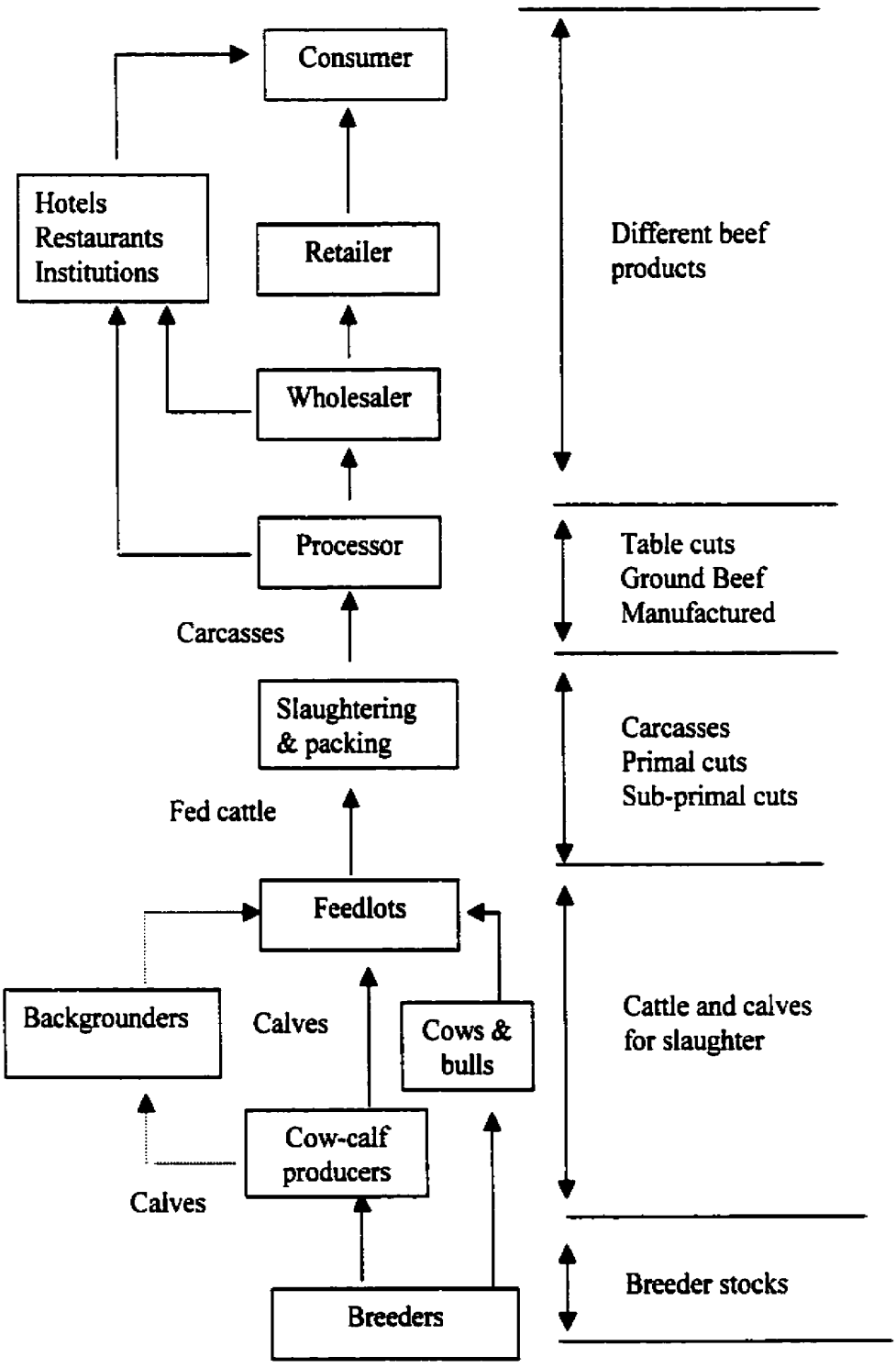


Figure 2.7 Beef Industry Structure in Canada

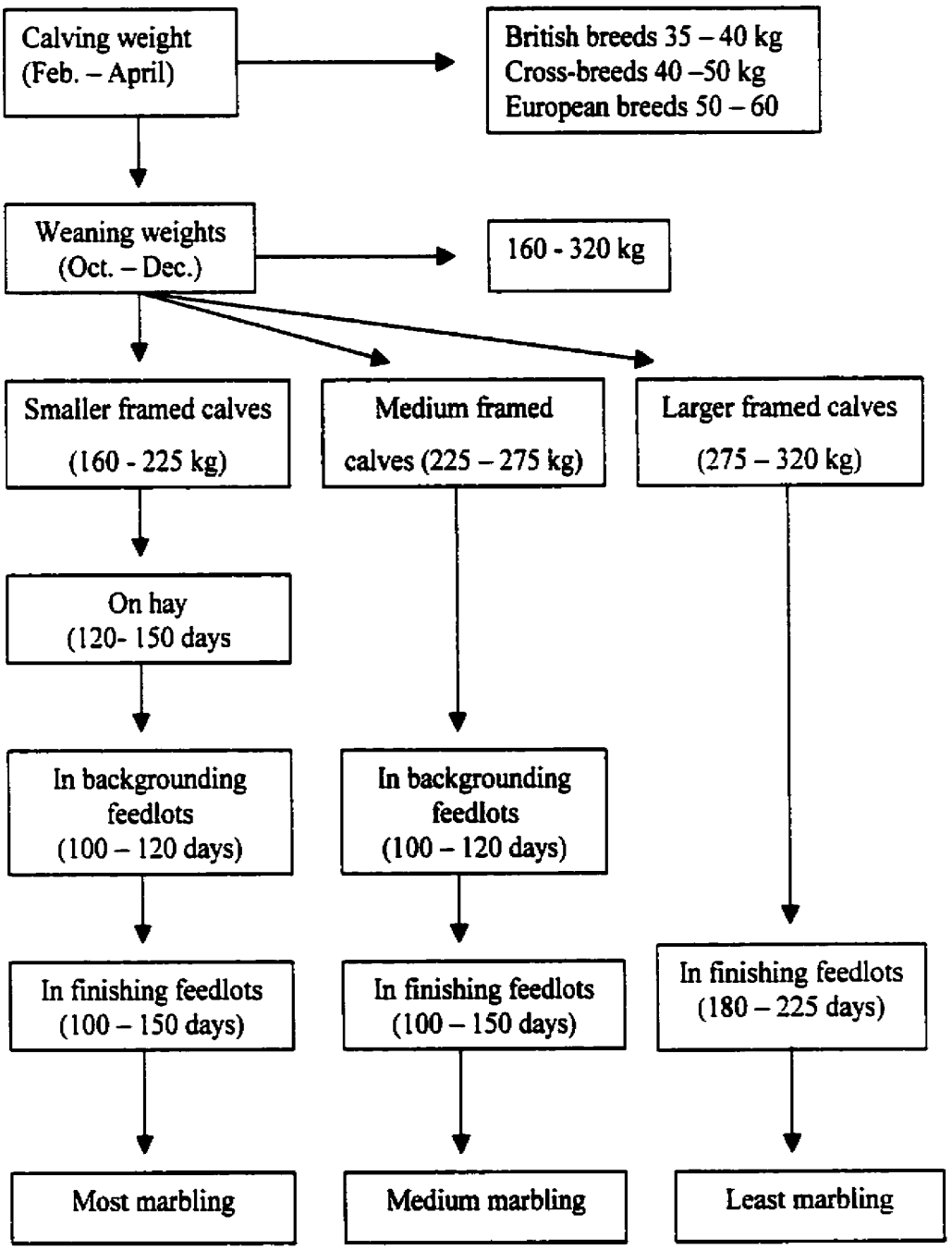


Figure 2.8 Beef Cattle Feeding Structure in Canada

or backgrounding operators, they will use different feeding systems depending on the weight of the animal. Steers and heifers, which enter the feedlot at higher weights are started directly on high energy rations. A cattle fed with high grain rations gain at about 1.7 kg. per day.

Once the animals reach slaughter weight, the finished cattle are sold to packing plants whose business is to slaughter the animals and process the carcasses for the wholesale and retail sector. Canadian beef and veal packers processed more than 3.48 million head of cattle in 1997. This is expected to increase to 4.2 million head by the year 2000 (Canadian Beef Export Federation, 1998). Although, the above stages are described as separate operations by different owners, in many instances the cow-calf, backgrounding and finishing operations are carried out by the same owner.

2.4 Beef Cattle Production in Saskatchewan

Although grain production remains the largest contributor to Saskatchewan's agricultural economy, the beef industry plays a significant role in many farming operations across the province. Of the 57,000 farms in Saskatchewan in 1996, approximately 25,000 have beef cattle (Statistics Canada, 1997). In 1994 and 1995, cattle contributed the third highest cash receipts after wheat and canola (Coghill and Brown, 1998) and represented almost 14 percent of the gross return on cattle production in Canada (Table 2.1).

Although mixed farm operations were common in Saskatchewan in the 1950s and 1960s, at present, farms are more specialized. The trend toward large cowherds per farm is evident from Figure 2.4. The organizational structure of the beef cattle industry in Saskatchewan is also similar to that described above.

Saskatchewan with a population of one million produces surplus beef. Much of the province's beef is thus exported to other provinces and the world. To be competitive, the Saskatchewan producer must be able to produce beef at a cost that is at least comparable to producers in other countries or regions closer to consumers. The WEFA (1993) reported that Saskatchewan's cost of production is very

competitive with other regions because of high quality genetics, good management, and a large area of land suitable for pasture and feed production. This makes Saskatchewan also ideally suited for cow-calf production and/or backgrounding.

In 1970, Saskatchewan had 2,160,000 cattle. This number has fallen to 1,777,000 by 1985, a decline of eighteen percent (Table 2.2). Since then cattle

Table 2.2 Cattle and Calves on Farms in Canada, January 1, 1970 – 1997, ('000)

Years	Total Canada	Saskatchewan						
		Total	Bulls	Cows		Heifers	Steers	Calves
				Total*	Beef			
1970	12,826	2,160	42	1,010	905	195	119	775
1975	14,278	2,787	50	1,328	1,248	250	205	940
1980	12,126	2,045	41	1,038	945	180	115	654
1985	10,979	1,777	39	845	778	167	128	580
1990	11,145	1,801	38	836	786	159	87	664
1991	12,842	1,823	37	887	843	154	68	663
1992	13,197	2,158	47	984	940	252	100	760
1993	13,417	2,214	49	1,003	960	270	91	787
1994	14,252	2,210	49	1,022	980	223	81	820
1995	15,114	2,349	50	1,093	1,052	246	89	856
1996	14,893	2,545	52	1,145	1,105	292	78	962
1997	14,790	2,526	54	1,161	1,122	255	100	940

* Includes dairy cows

Source: Saskatchewan Agriculture and Food (Various issues)

numbers gradually increased and reached to 2,526,000 by 1997. A comparatively, poor grain economy in the late 1960s and early 1970s coupled with the Farmstart program, which provided grants and low interest loans for the livestock sector, encouraged the expansion of livestock industry during this period. However, with the increase in grain prices after the 1970s, many farmers sold off their cowherds, which may be debatable, and as a result cattle numbers declined. As discussed in section 2.2.1, an increased cattle population, especially after 1989 can be attributed mainly to the CUSTA and NAFTA trade agreements and a discontinuation of crow benefits.

A similar pattern could also be observed for beef cow numbers in the province. For example, the total beef cows in 1975 were 1,248,000 and this fell for the subsequent years, reaching 778,000 in 1985, which is a 38 percent decrease. This number then gradually increased over time reaching 1,122,000 by 1997, a 31 percent increase. Saskatchewan's cowherd has grown a little more than the growth in the national cowherd. From 1970 to 1997 the Saskatchewan cattle herd increased by about 17 percent while the national cattle herd increased by only 15 percent (Table 2.2).

Over 60 percent of all feeders produced in Saskatchewan were exported out-of-province for finish or slaughter in 1997 (Table 2.3). For example, Saskatchewan

Table 2.3 Cattle Marketed in Saskatchewan, 1977 – 1997

Year	No. of slaughter cattle marketed	No. of feeder cattle marketed		
	Total	Total feeders produced	No. of feeders exported	% of feeders exported
1977	561,890	943,110	658,920	69.87
1980	205,670	882,770	643,910	72.94
1985	421,980	658,430	423,560	64.33
1990	330,710	764,450	436,810	57.14
1991	301,250	725,330	403,290	55.61
1992	335,430	813,610	494,520	60.78
1993	337,090	928,840	558,480	60.17
1994	325,390	875,840	448,410	51.21
1995	353,820	855,640	480,760	56.22
1996	402,190	896,820	553,730	61.71
1997	376,880	1,011,520	646,130	63.82

Source: Saskatchewan Agriculture and Food (Various Issues)

exported about 73 percent of feeders produced in 1980, which is the largest for the last two decades. This number has gradually fallen to about 64 percent by 1997,

which may be attributed to the increase in cattle feeding operations in the province. In 1997, Saskatchewan exported 646,130 head of cattle, of which 73 percent went to Alberta, five percent to Manitoba, ten percent to Ontario and twelve percent to the USA. The less than one percent went to the other provinces in Canada (Saskatchewan Agriculture and Food, 1997).

In 1970, cash receipts from cattle and calves were $ 138 million and this number increased to $ 582 million by 1990 and to $ 785 million by 1997 (Table 2.4).

Table 2.4 Cash Receipts from Farming Operations in Saskatchewan, ('000)

Year	Cattle and calves	Hogs	Sheep and lamb	Wheat	Cattle & calves as a % of wheat
1970	138,717	50,659	914	384,184	36.1
1975	318,449	64,507	1,698	1,090,199	29.1
1980	553,916	76,505	1,679	1,763,886	31.4
1985	522,262	95,063	2,122	1,367,878	38.1
1990	582,228	140,807	2,770	1,401,822	41.5
1991	557,498	128,141	3,101	1,546,558	36.1
1992	645,086	129,016	3,140	1,244,956	51.8
1993	770,076	154,344	3,457	1,937,791	39.7
1994	690,601	150,985	3,099	1,427,842	48.3
1995	635,256	157,393	3,686	1,495,705	42.4
1996	636,370	192,867	5,457	1,813,311	35.9
1997	785,415	197,256	6,043	2,021,239	38.8

Source: Saskatchewan Agriculture and Food (Various Issues)

The importance of cash receipts from cattle and calves relative to that of wheat is also increasing but it varies. For example, in 1980 cash receipts from cattle and calves as a percentage of receipts from wheat were 31 percent. It reached 52 percent in 1992 and then declined to 39 percent by 1997. Compared to the cash receipts from pork and sheep, the cash receipts from cattle and calves are consistently

higher. Although the beef industry in Saskatchewan is widespread, two areas seem to dominate in the production of cattle (Table 2.5). A higher percentage of cattle

Table 2.5 Total Cattle and Calves on Farms in Saskatchewan by Crop District

Crop district	June, 1991	%	May, 1996	%	July, 1997	%
1	233,715	10.2	265,918	9.8	286,900	9.9
2	124,198	5.4	147,555	5.4	158,400	5.5
3	410,857	17.9	506,804	18.6	527,100	18.3
4	235,745	10.4	274,277	10.1	283,000	9.8
5	283,534	12.4	320,605	11.7	326,200	11.3
6	245,546	10.8	309,247	11.4	306,500	10.6
7	157,273	6.8	190,896	7.1	208,100	7.3
8	121,789	5.4	155,250	5.7	162,500	5.6
9	473,187	20.7	553,090	20.2	626,300	21.7
Total	2,285,844		2,723,642		2,885,000	

Source: Saskatchewan Agriculture and Food, 1997

production is located in the crop district 3, located in north-west of Saskatchewan, and crop district 9 located in south central Saskatchewan, which together account for about 40 percent of cattle and calves in Saskatchewan.

In comparison to Saskatchewan, the province of Alberta has larger feedlot operations. Favourable environmental and climatic conditions for feed grain production, the development of transport, veterinary care, markets and other infrastructure facilities coupled with the major investment in packing sector by large US based firms have encouraged the expansion of feeding industry in Alberta. This makes Alberta a strong competitor in beef cattle feeding in Western Canada.

In general, beef production in Saskatchewan is a supplementary enterprise to grain operations, it utilizes marginal land, as well as leased land for the production of beef cattle. It is the traditional practice in Saskatchewan to sell calves in the fall, which necessitates the maintenance of only the cowherd during the winter.

The packing industry in Saskatchewan is relatively small. At present, there is only one packer in the province, the Western Canadian Beef Packer (WCBP), located in Moose Jaw, which slaughters about 3400 head per week (Miller, 1999b). This packer has two plants: a base slaughter plant and a value-added plant. The base plant produces generic beef, while the value-added plant produces boxed beef. Of the total beef production, about 60 percent is boxed and more than 60 percent of it is exported to the US. The remaining 40 percent go to Quebec and Alberta. If Saskatchewan could develop a system to feed at least an additional 300,000 calves within the province, the revenue from beef would increase the province income by more than $58 million annually (Miller, 1998). Miller has suggested that Saskatchewan needs to develop a quality oriented value-added business that addresses the whole-of-chain approach to beef production in order to compete in an emerging international beef market. He explained this situation as:

> *"WCBP, however, has no intention to compete with the large volume oriented American style packer. Our survival depends on marketing quality beef delivered to customer specs, throughout an international marketplace in Canada, United States and the Pacific Rim. WCBP must also continue to develop value-added products that are counter ready and table ready for both the customer and food service industries" (p. 59).*

One country currently following this strategy is Australia. The Meat Research Corporation (MRC) in Australia developed a system to incorporate small to medium size producers into a more efficient production continuum. The Marketlink and the Meat Standard Australia (MSA) are the two approaches to this system. These two approaches are, however, not mutually exclusive. They can complement each other to result in a more efficient production and marketing system (see chapter 3 for more details).

The most striking features of these two strategies are the recognition of the importance of partnerships and producing consistent high quality meat desired by consumers. Therefore it makes sense to examine what Australia is doing for small to medium size beef producers as this may be equally applicable to Saskatchewan

producers. The next chapter discusses these two Australian strategies and the different types of beef systems in North America.

CHAPTER 3

CASE STUDIES

3.1 Introduction

The purpose of this chapter is to describe the beef systems and quality assurance schemes in North America and Australia. The chapter begins with a discussion of quality assurance and beef grading in Canada (section 3.2). Section 3.3 discusses the approaches for greater vertical coordination of the beef industry in the United States. The Australian approach to greater vertical coordination in the beef industry is discussed in section 3.4, which shows an example of coordination mechanisms that might have relevance in Saskatchewan to overcome the horizontal and vertical fragmentation of the Saskatchewan beef industry. The final section highlights the important issues presented in this chapter and a link to chapter 4.

3.2 Quality Assurance and Beef Grading Systems in Canada

3.2.1 Quality Starts Here

The Canadian Cattlemen's Association (CCA), established in 1932, was structured to represent every phase of the production system, and assist in its development, adaptation to new ideas and technologies. The CCA is involved in a wide range of issues, which include trade, animal health, environment, grading and inspection services. The Canadian beef cattle industry under the auspices of the CCA developed an initiative called Canadian Beef Industry Quality Assurance and Product Safety Program. This was instituted in January 1995 to assure continued market access and consumer confidence. The main objectives of this program are: (i) to establish procedures at the production and processing stages to ensure a safe and healthy product; (ii) to improve the quality of the product; and (iii) to improve returns to all sectors of the industry (Canadian Cattle Identification Agency, 1999). In January 1996 the Canadian Beef Industry Quality Assurance and Product Safety Program was renamed as *"Canadian Cattlemen: Quality Starts Here"* to further

articulate the responsibilities and initiatives of producers and industry to ensure the quality and safety of Canadian beef. Since the inception of the program, the Management Committee has initiated several projects across Canada to address the quality and safety objectives. These initiatives are: (i) Canadian beef quality audit; (ii) cull cow study; (iii) tag score study; (iv) cow-calf injection study; (v) injection site survey; (vi) injection site audit; and (vii) cold chain management and is discussed below.

(i) Canadian Beef Quality Audit (CBQA)

The CBQA was initiated in 1995-96 to determine the baseline level of economically important management-induced non-conformities in fed and non-fed cattle in Canada. The results of the audit are being used to increase producer awareness of quality issues, to encourage improvements in management to reduce non-conformities, and to identify areas of further research needed to address these problems.

(ii) Cull Cow Study

Because of increasing pressure on all sectors of the industry to reduce the level of pathogens in raw meat products, the cull cow study was initiated in 1996. The objective of this study was two-fold. First, the study determined the prevalence of pathogens in slaughter cattle. Second, the study determined if there is a higher prevalence of this pathogens in cull cows than fed yearlings. Results showed a low level of E.coli 0157:H and a very low level of Salmonella in the feces of fed and non-fed cattle at slaughter. E.coli 0157:H increased in the feces of cattle during the summer months and was higher in fed cattle than in cull cows.

(iii) Tag Score Study

This study was designed to investigate the degree of association between tag on the carcasses at slaughter and the level of bacterial contamination on the carcass

immediately after skinning. The results of the study showed no consistent, simple association between tag on the hide and bacterial contamination.

(iv) Cow-Calf Injection Site Study

The objective of this ongoing study was began in 1996/97 was to determine the prevalence, severity and economic losses from injection site lesions in beef carcasses produced when calves are injected with commonly used antimicrobials, vaccines and vitamins. It is intended to indicate whether current recommendations for the uses of animal health products are sound. Finidings may also provide impetus for the pharmaceutical industry and licensing bodies to provide tissue reactivity methods in carcasses, and develop non-irritating products or alternate methods of administration.

(v) Injection Site Survey - Non-fed Beef

The objective of this study was to determine and monitor the prevalence of injection site lesions in outside rounds from cull cows and bulls, which are also part of the beef supply chain. The first survey was completed in 1997. The results will be used to encourage changes in injection site practices in cattle for the same reasons cited for the fed cattle audit.

(vi) Injection Site Audit – Fed Cattle

The first Canadian injection site audit on fed beef was conducted in 1996-97. This project was designed to determine the incidence of injection site blemishes in top sirloin, beef rounds and blade steaks (chuck). This information will be fed back to producers to increase awareness and encourage changes in injection site techniques and product use to prevent economic losses from excess trim and reduced tenderness. Losses have been estimated to range from $8.05 to $9.58 per head processed or $17 to $21 million annually to the beef industry (Canadian Cattle Identification Agency, 1999). Technology transfer has included scientific publications, lay press articles, and presentations to producers and veterinarians. The

results will be used to encourage improvements in injection site techniques for the sake of product safety, quality and economics.

(vii) Cold Chain Management: Temperature Control during Distribution of Beef

The results of this ongoing study are expected to be available by winter 1999. The objectives of this baseline study are: (i) to define current systems for the distribution of beef within Canada; (ii) to establish the nature and magnitude of the economic losses occurring at each stage of the distribution system as a result of inadequate control of product temperatures; (iii) to identify current understanding in the industry of cooler temperature control and causes of loss of control, (vi) to determine the economic and health consequences of loss of control; (v) to identify the age and temperature profiles of beef products at various stages of the distribution system; (vi) to use temperature function integration techniques to relate age and temperature profiles to health risks and economic losses; and (vii) to verify the procedures used for relating age and temperature profiles to health risks and economic losses.

Special Initiatives

Under the Canadian Cattlemen: Quality Starts Here program, three major special initiatives were undertaken to ensure quality of beef. These initiatives are: (i) responsible pharmaceutical use working group, (ii) cattle handling working group, and (iii) water strategy working group.

(a) Responsible Pharmaceutical Use Working Group

The responsible use of animal health products is one of the main assurances producers can offer in the marketing of wholesome beef. A number of issues require attention to continuously improve this status. It is generally acknowledged that the extra and off-label use of animal health products is not responsible management. The Responsible Pharmaceutical Use Working Group is articulating this message through

education efforts. The group is supporting research aimed at improved detection techniques, and is concerned with regulatory aspects of non-compliance and issues relating to surveillance of import practices.

(b) Cattle Handling Working Group

The objective of the Cattle Handling Working Group is to address product quality problems related to transportation and handling methods. This objective is being addressed through training, communication and research. Current projects underway include the use of safety cushions to decrease bruising in transportation, developing a cattle handling and hauling training course and studying the impact of horns and transport as factors in carcass bruising.

(c) Water Strategy Working Group

This is in the developmental stage. Its objectives will be to monitor, assess and provide input on the research and strategy initiatives for livestock and be proactive in the development of a water management strategy consistent with the Quality Starts Here program.

Educational Initiatives

The diversity of educational material that has been developed under the auspices of the Canadian Cattlemen: Quality Starts Here program has utilized the findings from the various research projects. The basic objective is to demonstrate that this procedure for enhancing safe food production becomes part of the Canadian beef cattle management system. These are voluntary production practices and independent verification that these practices are being followed is not part of the initiative. The initiatives are described below.

(a) Good Production Practices

Good Production Practices manuals provide guidelines related to production practices for the Canadian feedlot and cow-calf sectors. They were developed and

made available with the objective of improving the quality of beef. A total of more than 10,000 copies have been made available to feedlot and cow-calf producers through producer groups, pharmaceutical companies, veterinarians and public or private extension agencies. In addition, slide sets of the materials have been made available to key stakeholders in the industry for enhanced educational use. Calendars published by supply companies and government extension services have incorporated the Quality Starts Here message into the context of timely management reminders. Computer generated presentations have also been developed to ensure timely updates and many provincial organizations have developed display units exclusively to promote the concept of Quality Starts Here.

(b) Recommended Operating Procedures for Feedlot Animal Health

The Alberta Cattle Feeders' Association (ACFA), in conjunction with the Quality Starts Here Program, has developed a detailed manual called "Recommended Operating Procedures for Feedlot Animal Health". These are voluntary practices and are intended to provide a guideline for feedlots to help develop and implement quality and safety assurance programs at the feedlot.

(c) CD-ROM Infobase

Canadian Cattlemen: Quality Starts Here information has been made available in the CD-ROM format to cattlemen, animal health companies, veterinarians, universities and other beef industry partners. This initiative by the Ontario Cattlemen's Association also includes a Canadian Beef Cattle Infobase. The Infobase contains technical bulletins and fact sheets related to beef cattle production at the national level.

3.2.2 Canadian Cattle Identification System

With the recommendation of the CCA's Animal Health and Meat Inspection Committee, the Canadian Cattle Identification Agency (CCIA) was formed. It is a non-profit industry agency incorporated to establish a national cattle identification

program in Canada. The objective of the CCIA was to establish a national identification of cattle and traceability systems for Canadian cattle. The agency is led by a Board of Directors made up of representatives from all sectors of the cattle industry – Canadian Cattlemen's Association, Livestock Marketing Association of Canada, Canadian Meat Council, Canadian Veterinary Medical Association, Dairy Industry and Province of Quebec. The Canadian Food Inspection Agency, Agriculture and Agri-Food Canada and the United States government are also represented (Canadian Cattle Identification Agency, 1999). The objective of this program is to maximize quality and improve returns to all sectors of the industry and establish a national cattle identification and treceability system.

The identification ear tag will contain a visible unique number, bar code and CCIA logo. The tag will be applied by the time an animal leaves the farm of origin and will be maintained up to the point of meat inspection. The number will be assigned by the CCIA to tag companies and tags will be distributed through authorized service centers and distributors. The service centers will maintain records of which numbers went to which producers. Producers will not be required to maintain records but may choose to do so for their own management purposes. In the event of a health or safety issue involving a particular animal, the Canadian Food Inspection Agency (CFIA) will be given access by the CCIA to the recorded information. The CFIA will then be able to trace the animal back to the farm of origin. At present, the system is not compulsory. However, once it has received support from the industry and is proven to be cost-efficient, it will be mandatory.

This system seems to have great advantage to the Canadian agricultural economy. As Canada exports more than 50 percent of its beef and beef cattle, issues related to health and safety could results in the loss of markets both domestically and internationally. As this system allows traceback animals to the farm of origin, it is an important step towards securing consumer confidence and therefore protecting markets.

Canada is not the only country moving towards such a national identification system for cattle. The European Union, United States, Argentina, Australia and New

Zealand are also moving aggressively to implement an identification system for cattle. In fact, the United Kingdom in September 1998 started its compulsory cattle identification system, which is called Cattle Tracing System (CTS). The British Cattle Movement Service (BCMS) administers the CTS, tracking every calf, cow and bull registered from birth to death. The CTS uses specially designed scanning equipment to process applications for cattle 'passports' and reports of cattle movements. In comparison, CCIA uses ear tags for the identification of cattle that leave the farm of origin and authorized service centers maintain the records of which number went to which producers. In the UK, movements of cattle have to be registered with BCMS within fifteen days and deaths must be reported within seven days. The British Government is paying for the start-up costs and first year operating costs of the CTS.

In the case of the rest of the European Union countries, a passport for each head of livestock (cattle, sheep and goats) is issued within 14 days of notification of birth. The passport contains ID code, birth date, sex, breed or coat colour, ID code of the dam and sire, ID code of the farm of birth and all farms where the animal has been kept, signature of the owner and issuing authority. Animals may be moved only if accompanied by their passports. By January 2000 all livestock will be expected to tag by 20 days after birth. The ID code will follow the animal through a mandatory meat labeling system.

The United States National Cattle Identification (NCID) system is under development, to be administered by a board of representatives appointed by the National Cattlemen's Beef Association (NCBA). The NCID system will monitor carcass quality and will be available for traceback for health and safety. An owner of the animal during its lifetime or an authorized agent for the owner (i.e. custom feeder, auction market etc.) can access the data. Data will be provided to the U.S. government by the NCID governing board under specific circumstances, such as a disease outbreak.

A National Task Force on Identification has been established to determine the most appropriate system for Argentina. The Argentina beef industry relies on

international markets and it is recognized that lack of identification and traceability could present barriers to trade in the future.

The Australian National Livestock Identification System is expected to be in place by the year 2000. The system is a joint industry/government project and is expected to maintain and improve market access by improving traceback. The Cattle Council of Australia has endorsed a 14 digit cattle identification tag that will identify the state, region, herd, year of issue and individual animal. Tags will be machine readable and applied at herd of origin.

In essence, the process of cattle identification can helps facilitate protection of animal health and food safety, markets and consumer confidence. Although the Canadian cattle identification system provides information about farm of origin of cattle and subsequent owners, it does not provide downstream buyers with information about on farm production practices and therefore does little to lower the monitoring costs of downstream buyers with respect to quality. It also does not guarantee that type of beef that is desired by the consumer will be produced.

3.2.3 Beef Grading in Canada

The primary purpose of the beef grading system is to separate cattle carcasses into uniform groups to facilitate marketing into different markets. It also provides a tool for expressing and comparing prices and enhances marketing and merchandising of beef. Grading focuses on factors correlated with beef eating quality and yield. Even though grading is optional, the grade and yield of a carcass determines its initial value and possible uses in the food industry.

The Canadian beef grading system was first instituted in the late 1920s. Since then numerous changes have taken place. In 1992, significant amendments were made to the beef grading system designed to provide the consumer with assurances of quality such as differentiation of product based on maturity, marbling and colour. A grading service is provided in abattoirs, which receive either federal or provincial meat inspection services.

How Beef is Graded

A carcass may only be graded after it has been inspected and approved for health and safety standards, and bears a meat inspection legend or stamp. The factors used in grade assessment are related to the tenderness, juiciness, consumer acceptability, shelf life, and carcass yield.

The following characteristics are used in beef grading in Canada (Canadian Beef Export Federation, 1998).

- *Age of animals:* youthful animals generally produce more tender meat,
- *Sex:* pronounced masculinity adversely affects meat tenderness,
- *Muscling:* muscling influences meat yield,
- *Fat colour, quality and cover:* These affect consumer acceptability (colour) and eating characteristics (quality and fat cover), and
- *Meat colour, texture and marbling:* These affect consumer acceptability (colour and texture) and eating characteristics (marbling).

At present, the Canadian beef grading system classifies beef into four major categories further classified into thirteen categories based on the characteristics noted above. These beef grades are:

(a) Canada A, Canada AA, Canada AAA, and Canada Prime,

(b) Canada B1, Canada B2, Canada B3, Canada B4,

(c) Canada D1, Canada D2, Canada D3, and Canada D4,

(d) Canada E.

The characteristics of these different grades are as follows.

(a) Canada A, Canada AA, Canada AAA, Canada Prime

These are the highest quality Canadian beef grades. Canada Prime became an official grade in August 1997. The grade criteria for these four grades are identical except for marbling content. The identical features of these grades are:

- youthful animals (less than 30 months of age at slaughter),
- good to excellent muscling,
- firm muscles,

- bright red meat colour and firm textured rib-eye muscle,
- minimum of 4 mm of thickness of external fat at the rib-eye measurement site and the fat must be firm or no more than slightly tinged with reddish or amber colour.

The marbling content is used to distinguish between these four grades. Thus, beef with trace marbling is categorized as Canada A grade while Canada AA, AAA and Prime grades have slight marbling, small marbling and slightly abundant marbling, respectively.

Canada A/AA/AAA and Prime carcasses are assessed for lean meat yield. The yield is determined by measuring exterior fat thickness as well as the length and width of rib-eye muscle using the equation:

Lean % = 63.5 + 1.05(muscle score) – 0.76(grade fat).

Three yield groups are distinguished:

Canada 1 - carcasses with 59% or more of lean usable meat;

Canada 2 - carcasses with 54 - 58% of lean usable meat; and

Canada 3 - carcasses with 53% or less of usable lean meat.

(b) Canada B1, Canada B2, Canada B3, Canada B4

These grades are obtained only from youthful carcasses which do not meet the minimum quality requirements of the Canada A/AA/AAA and Prime grades. Thus:

- *B1 carcasses* show good to excellent muscling with no deficiencies. The rib eye muscle is firm and bright red. The fat is firm and white or amber in colour. The fat measure is less than 4 mm and/or there is no marbling,
- *B2 carcasses* have deficient to excellent muscling. The rib eye muscle is bright red and there are no requirements for marbling. Fat colour is yellow and there is no fat measure requirement,
- *B3 carcasses* have deficient to good muscling. The rib eye muscle is bright red. There is no requirement for marbling. The fat is white or amber in colour and there is no fat measure requirement, and

- *B4 carcasses* have deficient to excellent muscling. The rib eye muscle is dark red and there are no requirements for marbling, fat colour, texture or fat measure.

(c) Canada D1, Canada D2, Canada D3, Canada D4

Canada D grades are from mature animals (over 30 months of age) and there are no requirements for either the rib eye muscle or for marbling. They are primarily used for ground beef or processed beef products. Specifically:

- *D1 carcasses* have excellent muscling. Fat is firm in texture and white or amber in colour. The fat measure must be less than 15 mm.
- *D2 carcasses* have medium to excellent muscling. Fat colour is white to yellow. The fat measure must be less than 15 mm.
- *D3 carcasses* have deficient muscling. There are no requirements for fat colour or texture. The fat measure is less than 15 mm.
- *D4 carcasses* have no requirements for muscling, fat colour and texture. The fat measure is 15 mm or more.

(d) Canada E Grade

Canada E grades are reserved for mature bulls or youthful carcasses showing pronounced masculinity. These carcasses are primarily used for producing ground beef or processed beef products.

This description of the Canadian grading system above shows how emphasis is placed on the farm-level characteristics of the animals slaughtered. They include the age, sex, genetics, and feeding practices. There is nothing in the grading system that relates specifically to practices or requirements further down the supply chain such as consumer taste and preferences.

3.3 Innovative Approaches for Greater Vertical Coordination in the US

3.3.1 US Angus Beef

The Angus beef program is a Division of the American Angus Association. In response to the wider variation of beef grades, the American Angus Association established this Angus beef program in 1978 whose mission is to increase demand for registered Angus cattle by providing consumers with consistent high quality branded beef (American Angus Association, 1998). Only licensed packers, distributors, restaurants and retail stores may use the certified Angus beef trademark to promote the product. The program does not own the cattle but works with program licenses to closely regulate and maintain product integrity.

Since the program's development, the USDA grading service monitors and evaluates the beef for the Angus beef specifications. The program provides Certified Angus Beef (CAB) product to more than 2,600 licensed restaurants and over 2,500 licensed retail stores throughout the US and more than 45 countries. The certification process begins at licensed packing plants. The incoming cattle with solid black are visually identified initially (i.e., more than 50% black). The USDA grader then evaluates only selected steer and heifer carcasses for the following specifications:

- Modest or higher degree of marbling - Proper marbling is essential to beef flavour and juiciness,
- Medium or fine marbling texture: Coarse marbling reduces beef quality
- "A" maturity - Young cattle (less than 30 months of age) tend to produce beef with superior colour, texture, firmness and tenderness,
- Yield grade 3.9 or leaner – This ensures a product without excessive fat cover,
- Moderately thick or thicker muscling characteristics. This ensures a higher proportion of muscle to bone,

- No hump on the neck exceeding 2-inch height. This eliminates the cattle with significant Brahman content, which reduces the variation in tenderness of beef,
- No evidence of internal Hemorrhages. Blood spots evaluated at the rib eye muscle, and
- No dark cutting characteristics. Dark colour beef is not acceptable to the Certified Angus Beef Program.

Only the carcasses that meet the above specifications will be labeled with the federally registered Certified Angus Beef trademark and distributed to wholesalers and retailers around the world.

Although, the program identifies cattle at the packing plant level, it has a major impact on the cattle business at both ranch and feedlot levels. Angus cattle command the best prices both as feeder and finished cattle. Packers know that they can be assured of high quality carcasses if they buy Angus or Angus crosses. Cattle producers are turning more to Angus cattle. In fact, research has shown that over 50 percent of all beef cowherds in the US include Angus as the major cow breed. Angus or crossbred Angus cattle qualify visually for the CAB program. This feature significantly impacts the feedlot operators and packers, an impact, which ultimately transfer back to the cow-calf producers. Producers who are linked to the program have incentives to produce Angus or Angus crossbred cattle and receive a premium price for the cattle they produce but there is no specific production practices recommended at the farm level. The CAB program guarantees the quality of beef through the selection of genetics, careful evaluation of beef and close monitoring of each activity in the processing and distribution stages.

3.3.2 Farmland Supreme Beef Alliance (FSBA)

The Farmland Industries Inc., Agri Beef Company and National Beef Packing Co. L.P. together formed the FSBA. The FSBA aims to bridge the gaps within the beef industry linking the consumer to the farm. The program is designed to capture

the added value of good genetics and management practices to beef cattle producers by retaining ownership through the finishing stage.

In 1995, the first cattle lot entered the program. Calves enrolled in the FSBA are fed at Supreme Feeders feedlots. Currently, more than 50 percent of the cattle herd in Supreme Feeders belong to alliance cattle. To qualify for the FSBA program, calves must have at least 50 percent Angus characteristics. The program aims to include most producers by allowing producers to choose one of the following options.

i. Retaining ownership and earning marketing premiums,
ii. Partnering with FSBA and earning a portion of both marketing and feeder calf purchase premiums, or
iii. Earning feeder calf purchase premiums by selling to FSBA.

The notable feature of this program is the exchange of information from the packing plant and feedlot to the producer. The FSBA staff is dedicated to collecting and reporting data no matter which ownership option a producer takes. If the calves have ear tags, they will be tracked through the system. Carcass data collected includes weight, quality and yield grades. The enrolment fee of $ 2.50 per head guarantees that they are in the program and eligible to get carcass information and price premiums. Premiums are paid for higher quality carcasses that grade prime or choice and meet Certified Angus Beef product qualifications. Carcasses meeting these requirements will earn premium of $ 3.50 per hundred weight. Basically, premiums are based on a regional Cattle-Fax base price. Cattle-Fax is run by the National Cattlemen's Association in the US whereby it collects information on price from direct producer-packer sales and calculates average prices, plus premiums for post-weaning health program (vaccination) and incentives for retaining one-half or higher percent ownership. In Canada, 'Canfax', which is run by the Canadian Cattlemen Association, collects similar information. Producers will be able to get as high as a $ 5 per hundred weight premium using a preconditioning (backgrounding for 45 days) program. The FSBA found that genetics are an

consistency and quality of the final product. In this respect, the FSBA identified 11 'seedstock' producers whose breeding programs promoted quality carcass genetics. However, it is not mandatory to buy bulls from these breeders to participate in the program but FSBA shows that premiums may double if producers buy bulls from them.

3.3.3 Harris Ranch Beef

The Harris Ranch Beef company is a part of the Harris Farm Group of Companies. Currently, this is one of the California's largest vertically integrated operations where they raise cattle, place them in feedlots, slaughter and process for wholesale and retail markets. It is a branded beef company producing beef under the USDA Residue Avoidance Program (www.harrisranchbeef.com, 1998). The company guarantees consumers that their beef is produced under the USDA Residue Avoidance Program (i.e., no added hormones, chemicals or artificial ingredients). This is possible because they monitor every step of the production process starting at the feedlot and packing plant to retail level. According to the company, the services of veterinarians and nutritionists assure that cattle receive the best care and most nutritious feed possible.

The company is able to produce about 200 million pounds of beef per year. In addition to fresh beef, it produces fully cooked beef products such as cooked beef Tri-Tip (portion of the bottom sirloin) and cooked beef pot roast and gravy. At present, it has a capacity to produce 250,000 head of cattle per year. At any given time, it produces about one-third of all the cattle finished in California. The company markets beef and other products across the west from California to Alaska. It has been able to capture 85 percent of the California's market. The company also owns a Harris Ranch Inn and Restaurant, which is located midway between Los Angeles and San Francisco. The restaurant serves only the Harris Ranch USDA Choice beef.

3.3.4 Beef Grading in US

The USDA grades were officially set in the late 1920s. Since then grade standards have been revised several times. The USDA carcass grading system includes two separate grade characteristics, quality and yield. The quality grades reflect the expected palatability of cooked beef while yield grades identify carcasses for the amount of lean meat. As practiced in Canada, the packers pay a fee for grading.

Quality Grades

There are eight USDA quality grades. They are prime, choice, select, standard, commercial, utility, cutter and canner. Each of these grades relates to a distinct combination of quality characteristics such as carcass class, maturity, and marbling content. Among these, the maturity and the marbling content are the most important quality characteristics.

Maturity is determined by evaluating skeletal of the carcasses. The overall maturity is established by balancing skeletal and lean meat, with skeletal maturity receiving the highest weight. Accordingly, there are five groups of maturity. A, B, C, D, and E based on these two measures. Table 3.1 shows the guidelines for determining skeletal maturity.

There are nine levels of marbling content. They are abundant, moderately abundant, slightly abundant, moderate, modest, small, slight, traces and practically devoid. The four highest quality grades (prime, choice, select and standard) are for carcasses in the A and B maturity groups only. The commercial grade is restricted to carcasses in the C, D, and E maturity groups. The grades utility, cutter and canner may include carcasses from any of the five maturity groups.

Yield Grades

The USDA established yield grades for beef carcasses in June 1965. Its use, however, was optional until 1975. Yield grades from the highest are designated Y1, Y2, Y3, Y4, and Y5. These yield grades are basically determined by (1) the thickness of external fat over the rib-eye at the 12^{th} rib, (2) the percentage of kidney, pelvic and

Table 3.1 Guidelines for Determining Skeletal Maturity in US Grading System

USDA maturity group	Sacral vertebrae	Lumbar vertebrae	Thoracic vertebrae	Rib	Age
A-	Sacral vertebrae	No ossification		Slightly tendency toward flatness	9 months
A+/B-	Sacral vertebrae	Nearly completely ossified	Cartilages show some evidence of ossification (10% ossified)	Slightly wide and slightly flat	30 months
B+/C-	Sacral vertebrae	Completely ossified	Cartilages are partially ossified (70% ossified)	---	42 months
C+/D-	Sacral vertebrae	Completely ossified	Outlines of cartilages are plainly visible (70% ossified)	Moderately wide and flat	72 months
D+/E-	Sacral vertebrae	Completely ossified	Outlines of cartilages are barely visible (90% ossified)	Wide and flat	96 months

Source: Texas Agricultural Extension Service

heart fat, (3) the surface area in square inches of the rib-eye muscle, and (4) the hot carcass weight. The following equation is used to determine the yield grade.

Yield Grade = 2.5 + 2.5 (adjusted fat thickness in inches)
+ 0.2 (kidney, pelvic and heart fat in %)
+ 0.0038 (hot carcass weight in lb.)
- 0.32 (rib-eye area in square inches)

3.3.5 Comparison of Canada-US Beef Grading Systems

As discussed above both the US and the Canadian grading systems have four highest quality grades obtainable from youthful carcasses. Canada prime, AAA and AA grades are the same as the US prime, choice, and select. Canada A is unique to the Canadian system, which possess all high quality attributes and trace marbling.

The US Standard grade is practically devoid of marbling hence it is not comparable with the Canada A grade.

The US grading system allows carcasses up to 42 months of age to stay in the four primary grades of prime, choice, select and standard if the carcasses show higher levels of marbling. The Canadian grading system, however, does not allow animals over 30 months and over to be in the Canada high quality grades and such older animals will be placed in grades D and E.

The US system penalizes dark coloured beef by no more than one full grade. i.e., prime to choice, choice to select, or select to standard. Dark coloured beef (dark cutter) will be penalized by less than one full grade, e.g., high choice to low choice. This allows the possibility for dark cloured beef to be in the choice, select or standard categories in the US. However, the Canadian grading scheme places dark colour beef in the B4 grade.

Although the Canadian grading system removes all carcasses with yellow fat from the high quality grades to the B2 grade, the US system does not penalize for yellow fat. Similarly, the Canadian grading system moves all carcasses with poor muscling from the four high quality grades to the B3 grade but the US grading system does not have minimum muscling requirements for its top grades. The US grading system allows moderately firm textured beef in US prime, slightly firm textured beef in US choice, slightly soft textured beef in US select and soft textured beef in the US standard grade. The Canadian grading system allows only firm textured beef in the four high quality grades and all carcasses with less than firm texture will be graded as Canada B.

The marbling content of Canada prime, AAA and AA grades are equal to that of US prime, choice, and select, respectively (Canadian Beef Export Federation, 1998). Although the level of marbling in Canada A and the US standard is approximately equal, the US standard grade is not comparable to Canada A grade because of numerous allowances for quality defects.

With respect to yield grading, the Canadian grading system uses 3-yield classification: Canada1, Canada 2 and Canada 3. The US grading system uses 5 yield

classifications: Y1, Y2, Y3, Y4, and Y5. The Canadian grades 1,2, and 3 are equivalent to US Y1, Y2 and Y3 grades.

In essence, Canada prime and US prime are identical except that the Canadian grade does not allow dark coloured meat, yellow fat, older animals or other off-quality characteristics. Canada AAA and US choice are identical except that Canadian grades do not allow dark coloured meat, yellow fat, older animals or other off-quality characteristics. The Canada AA grade is also similar to US select but again the Canadian grade does not allow dark coloured meat, yellow fat, older animals or other off quality characteristics. The Canada A grade, which contains less fat, is unique to Canada.

3.4 The Australian Approach for Greater Vertical Coordination

The Australian beef industry has identified the *commodity* nature of their beef industry as a major constraint to its development. The major factors contributing to the downward trend of their beef industry have been its inability to respond to changes in consumer demand, lack of consumer focus, lack of trust between processors and producers, lack of professional marketing expertise, lack of product innovation and value-adding and fragmentation of the production sector (Thompson, 1998). The Australian government and the beef industry see these problems as ultimately requiring a focus on producing different products based on eating quality rather than producing generic beef or a beef commodity. This, in turn, requires a restructuring of the meat industry to form a more highly coordinated supply chain.

Recognizing the importance of this, the Meat Research Corporation (MRC), a governmental organization, encouraged the formation of producer alliances in 1994. This initiative was known as Marketlink and is discussed in Section 3.4.1 below. It began with what is known as the Marketlink 1 program. This program was revised in 1996 as Marketlink 2. Parallel to the development of the Marketlink program, the MRC introduced a separate initiative, called Meat Standards Australia (MSA). The primary objective of the MSA is to provide consumers with consistent eating quality beef by developing quality *pathways* for the animals/meat products through the

supply chain. Eating quality is determined on the basis of palatability criteria. These include product treatment requirements (see section 3.4.2 for more details) which are noticeably absent in the Canadian grading system. The MSA initiative is described in Section 3.4.2.

3.4.1 Marketlink

Marketlink began in 1994 in response to what was seen as an overly fragmented beef supply chain, which was contributing to the country's declining export market performance. The objective of the initiative was to facilitate industry rationalization and the development of vertical and horizontal alliances. Marketlink's industry vision is to establish a large network of producers and their customers throughout the chain to manage producers' own supply, grading, marketing, research and development activities. In 1996, the MRC developed a more comprehensive program called the Marketlink Key Program (MKP). This more recent version of Marketlink is discussed in the next section.

The overall objective of the MKP program was to develop and implement competitive marketing strategies for Australian beef, sheep-meat, hides, and skins. The measurable outcomes of this program were: (i) adoption of consumer-driven marketing strategies; (ii) development of new value-added products to meet consumer needs in target markets; and (iii) formation of marketing partnerships (vertical alliances), and producer marketing groups (horizontal alliances).

The important elements of this program were the specification of consumer needs, objective measurement of the product to determine compliance with specifications, feedback of information at each stage of the chain, and trust and transparency of trading between market participants.

The MKP is also designed to meet industry needs by providing information and financial support to all sectors of the industry to facilitate structural change. An integrated feedback and payment system based on carcass and hide/skin quality and yield provides producers with an incentive to implement quality assurance systems to maximize the value of the animals.

The basic principle of the MKP is to encourage all sectors to work cooperatively, in an integrated manner, to deliver the 'right' product to the consumer with the objective of increasing per capita beef demand. Research and marketing activities are collectively planned and all parties involved in the supply chain share information. Under this program, basic information and training packages are available to all interested parties to assist in structural change throughout the industry.

The MKP is organized into three types of alliances (called strategies):

(1) Marketlink 1 (and hide improvement) alliances already established,

(2) Marketlink 2 alliances started in 1997, and

(3) Other industry alliances.

These are described in below.

(1) Marketlink 1

Established under this program in 1994, were six strategic alliances, namely:

i. *Supply of portion-control primal beef cuts to Sizzler restaurants and Your Kitchen catering center in Brisbane, by wholesalers Tenderplus and Kudos, South Burnett Meat Works and their cooperative producers*

ii. *Supply of portion-control and primal beef cuts to the Cairns Hilton, Radisson Plazza, Cairns Base Hospital and Manning Pies, by Byrnes Wholesale Meats, Byrnes Tolga abattoir and Northern Tableland Beef Producers*

iii. *Supply of retail beef cuts to Woolworths supermarkets in Geelong, in an alliance between Woolworths and M.C.Herd*

iv. *Supply of retail beef cuts to Bush's Fresh Meat Stores in Sydney, in a vertically integrated A.J.Bush alliance involving their wholesale distribution center at Rockdale and abattoir at Yanco*

v. *Supply of marbled grain-fed beef steaks to Tokyu supermarkets in Tokyo, Japan*

vi. *Supply of retail lamb cuts through butcher shops operated by the tenderlean group in Newcastle, with lamb supplied by the Guyra producer group and processed through the Scone abattoir.*

The MRC developed two initiatives (sub-programs) to assist these alliances. They were called: (A) the Alliance Support Services Sub-program; and (B) the Promotion and Marketing Sub-program. These are discussed in detail below. The MRC supported this strategy for about two years and found Marketlink 1 alliances to be an effective method for achieving cultural and structural change within the industry.

(2) Marketlink 2

Although the Marketlink program was proposed in 1996 under the MKP program, it began in April 1997 and is more comprehensive than Marketlink 1. In addition to receiving assistance from two sub-programs noted above, Marketlink 2 alliances also receive assistance in the form of two other sub-programs called: (C) Consumer Research and Product Testing Sub-Program, and (D) the Technology Support Sub-program. These Sub-programs and the type of assistance supplied are discussed in detail below.

(3) Other Industry Alliances

Other industry alliances include any others that develop between processor and large producers or producer groups in an effort to provide a reliable source of animals throughout the year. Such alliances can receive assistance under the alliance support sub-program. Under this strategy, Marketlink established the Beef Marketing Support Network in June 1997 to encourage producers to cooperate with other producers. This program supports producer groups in two ways. In part A, "seed money" is provided to a maximum of $5,000, to enable a producer group to begin it activities. In part B, based on the group's performance, quality specifications and the number of cattle marketed by the group, a further $20,000 is provided. Marketlink also assisted the development of vertical alliances by encouraging the development of a customer focus and market development by networking suppliers with customers beyond the producer. It has trained several network brokers who are used to facilitate entry into the program. These brokers play an important role in

networking producers with customers and help network members address the critical issues in the proper structuring of a commercially active network.

Another initiative under the Other Industry Alliances strategy is the hide improvement program. This is aimed at introducing a value based marketing system for hides by:

(i) identifying individual hides at abattoirs

(ii) grading the hides after tanning

(iii) using a specifically designed software package and a specifically built grading system to provide feedback of hide quality information and

(iv) differential payments to producers and processors.

The following describes the four Sub-programs noted under Marketlink 1 and 2 above.

(A) Alliance Support Services Sub-Program

This sub-program contains five components:

(i) Marketlink Information and Education Services (MIES),

(ii) Alliance Managers,

(iii) Meat & Hide Marketing Workshops,

(iv) Marketlink Supplier Accreditation Scheme,

(v) Data Management and Analysis.

Each of these components will be described separately.

(i) The Market Information and Education Services (MIES)

The MIES provides information and training to all interested companies and industry groups in several ways, as follows:

(a) An information brochure explaining the concepts, basic methodology and supporting services available to interested parties,

(b) The Marketlink manual to assist the implementation and management of strategic alliances,

(c) Workshop alliance facilitation by Accredited Network Brokers appointed by the program (available at consultancy rates),

(d) Training courses for end users, wholesalers, processors, and beef and livestock producers,

(e) Consultancy services on short-term facilitation and assistance in the early start-up phase,

(f) Marketlink database software and associated training in data management and analysis (software developed under Marketlink I program).

(ii) Alliance Managers

To provide support and communication between the sub-programs and alliances it was proposed that four sub-program alliance managers be appointed. Alliance Managers would also be appointed to all existing Marketlink I and Hide Improvements alliances. In the case of Marketlink 2 alliances, the network broker responsible for facilitating and validating the alliance relationships would most likely undertake the role of the alliance manager. Alliance managers could also be a consultant or an employee of the leading firm.

(iii) Meat and Hide Marketing Workshops

Meat and Hide Marketing Workshops are targeted at beef and sheep producer groups, particularly those who have formed horizontal alliances. These workshops address the following:

(a) Background on the Marketlink Key Program,

(b) Market information including the current trends in supply and demand in different markets, and factors affecting these trends,

(c) Presentation and explanation of an appropriate marketing model,

(d) Assessment of the performance of alliances using computer simulation.

(e) Discussion of the Marketlink Supplier Accreditation Scheme (MSAS).

(iv) Marketlink Supplier Accreditation Scheme (MSAS)

The Marketlink Program is expected to create networks, which can supply objectively specified products to meet different market needs. The MSAS facilitates and encourages cross-alliance marketing.

(v) Data Management and Analysis

This includes the development of financial indicators for individual companies, performance measures for Marketlink 2 alliances, maintenance of Marketlink 1 and 2 databases, analysis of data on request, and quarterly analysis and reporting performance indicators of each alliance.

(B) The Promotion and Marketing Support Sub-Program

Promotion and marketing support is provided to both Marketlink 1 and 2 Alliances. It includes training classes and workshops, development of marketing plans, advertising, promotion, and creative design.

(C) Consumer Research and Product Testing

This sub-program is concerned with identifying and meeting consumer specifications for the quality-differentiated products produced by these alliances. It identifies customer specifications through targeted consumer research at an early stage. Before investment, the market demand for proposed new products and services would be estimated to determine the viability of the new product. Once this new product has been developed, this sub-program will go through consumer trials to ensure that it satisfies the target consumers. The objective test is to ensure that products are of consistent quality at each level of production. Marketing tests are conducted to confirm consumer demand and refine promotional strategies.

(D) Technology Support

The individual alliances may need technological support to solve problems associated with product innovation, quality assurance or product testing. In addition. there will be an ongoing need to develop and refine existing technology, particularly with respect to the identification of animals, an objective measurement system for live animals and a carcass management information software. Product identification and tracking technology is suggested to be fundamental to value-based marketing systems and to the delivery of useful producer feedback.

One particular piece of technology developed and currently used under this sub-program is VIASCAN. This is regarded as the most promising prototype technology for measurement of carcass yield and quality attributes, and for quality assurance of portion cuts. The technology needed for these activities is supplied from the Marketlink Key Program.

Communication of the achievements of the Marketlink program to other participants and to the industry as a whole is critical to the overall Marketlink program. Hence, there is a publicity officer who is responsible for developing and implementing an effective communication strategy for different target audiences including the general public, the Marketlink program participants, and industry stakeholders.

Marketlink has also commissioned broader studies focusing on changing lifestyles, eating and cooking habits, attitudes toward food and nutrition, and the role of meat in the diet. These are seen as inputs for the future development of the Marketlink Program.

In essence, as an institutional innovation for improving the responsiveness of beef producers to consumer tastes and preferences, Marketlink is an "exclusive" approach. It fosters the development of exclusive supply chains in which produces who agree to the specifications of the supply chain leader, become a part of the system, while those who do not are excluded from the system. This approach is centered on the premise that the development of relationships (vertical and horizontal) is important in achieving the desired objective. However, there is another institutional innovation under way in Australia, which is "inclusive". It does not depend on the development of relationships and hence is much closer to the idea of a grading system. This is Meat Standards Australia.

3.4.2 Meat Standards Australia (MSA)

MSA was introduced as a pilot study in Australia in November 1997. Although this is known primarily as a meat grading system, it is both a grading and a trading system. MSA was initiated by the MRC as a way of responding to Australia's declining export market share. The theory was that Australia was losing out to the US, which could provide greater product consistency than Australia. The focus of MSA was to improve the consistency of the eating quality of beef.

Initially, this program started as a pilot project using Brisbane as the test market, but steps are now being taken to implement it at the national level. This scheme is also referred to as the "Eating Quality Scheme" and covers all aspects of producing and processing beef from *gate to plate*. It allows the product to be differentiated at the point of retail by identifying the eating quality that can be expected from a particular piece of beef cooked in a particular fashion. Accordingly, the scheme has three components at retail: (i) An MSA logo as a guarantee of quality; (ii) quality grade, (i.e. 3 star, 4 star, 5 star); and (iii) a recommended cooking method for each unit.

The objective of the MSA grading system is to provide consumers with the consistent quality beef attribute, which they desire. This means, if a beef product is marketed as having a particular quality characteristic (e.g. tenderness), there is a high probability the product will have this characteristic. MSA involves measuring palatability with confidence, determining the factors that impact on palatability, introducing a program of quality assurance at critical control points, and maintaining integrity of the system. MSA has sometimes been referred to as involving a PACCP (Palatability Analysis at Critical Control Points) system.

Major features of the MSA grading system were:

(i) carcass pathways,

(ii) driven by the consumer,

(iii) integrity of the system,

(iv) the consumer testing protocol / Meat Quality Score (MQ4),

(v) palatability analysis at critical control points,

(vi) the MSA data base.

These are discussed below.

Carcass Pathways

The process of producing cattle to deliver meat with a particular quality is known as a pathway. Accredited MSA graders at the abattoir separate the carcasses into different pathways based on the farm level factors such as genetics, quality of feed, veterinary treatments, weight gained pre-slaughter handling. The processors pay a fee for this service. The separation of carcasses into different pathways helps producers to perform uniform activities for the carcasses along the same pathway. This enables MSA participants to achieve efficiency in both the production and the marketing of beef.

The basic requirements required of all beef entering the MSA pathways can be categorized into two parts:

(a) Producer to Abattoir Requirements

- slaughter by the day after dispatch
- water available and consumed on arrival,
- practice of animal welfare codes at all stages from farm to slaughter.
- trained professional stock handlers at all locations,
- groups of cattle not to be mixed in lairage,
- no females which have calved,
- guidelines for dark cutting and eating quality observed.
- no secondary sex characteristics, and
- meat colour scores of 1B, 1C or 2.

(b) Critical Control Points (CCP)

Under the CCP, the following factors are considered.

- Carcass maturity. This is judged by an ossification score, which has to be less than 200. This is a subjective score on the degree of calcification of the cartilage of the vertebrae in the carcass. A score of less than 200 means that animals are most likely to be less than 30 months of age.

- Carcass weight for maturity. The growth pattern is measured by the weight adjusted for maturity factor (WAM) calculated as:

  WAM = [(Carcass weight/0.53) - 35] / (Ossification score in months)

The cutoff point for WAM estimated from the MSA data is 0.6 kg/day. Any animal with a WAM less than 0.6 kg/day will be rejected.

- Ultimate pH is 5.7 or less,
- Slaughter process to maintain a temperature and pH within the window of
  (i) pH above 6 when temperature is at or above 35^0 C
  (ii) pH below 6 when temperature is at or below 12^0 C
- Subcutaneous rib fat to be greater than or equal to 3 mm with even and adequate coverage across the rib, rump and loin.

In addition to these basic requirements, the MSA graders use the factors listed below to separate carcasses into the different categories of pathway: (i) three star; (ii) four star; and (iii) five star.

(i) Three Star Carcass Pathway

There is only one pathway for three star carcasses and, therefore, the production of three star beef. In addition to meeting the basic requirements, three star carcasses should meet the following requirements:

- No more than 25% Bos Indicus content
- Carcass aged for 5 days
- Carcass to be tenderstretch hung
- Maximum ossification score of 150
- Minimum carcass weight of 150 kg.
- Weight for maturity score of greater than 0.6 kg/day.

The MSA has shown significant differences from Bos Indicus content of cattle and therefore palatability of the meat. Since the MSA grading system is sensitive to Bos Indicus content, the cattle supplier must declare (in a vendor declaration) the Bos Indicus content of the cattle as a range of 0- 25% or 26 - 50% or

over 50%. Cattle with over 50% Bos Indicus content are not eligible for MSA grading.

Tenderstretch hanging is used to avoid the toughening that occurs with muscle shortening during rigour. Thus the carcass will be hung in such a way that there is maximum tension on the muscle so it cannot shorten during rigour. Since muscles in the leg of many of the normally hung carcasses are not under tension during rigour, the MSA uses this as one of the Critical Control Points of its grading system. Researchers have found that the backbone in a tenderstretch carcass is straight so shortening cannot occur. Furthermore, tenderstretch causes an eight to ten point increase in the MQ4 score.

Three Star Vacuum Packed Pathways

Many meat products (especially exports) are vacuum packed as a way of extending shelf life. There are three approved pathways for three star vacuum-packed products:

Pathway 1

- Up to 25% Bos Indicus content
- Carcass to be hung by the Archilles tendon
- Cuts to be aged for a minimum of 14 days.

Pathway 2

- Up to 25% Bos Indicus content
- Carcass to be tenderstretch hung
- Cuts to be aged for a minimum of 14 days
- No weight for maturity requirement

Pathway 3

- Bos Indicus content to range between 26 - 50%
- Carcass to be tenderstretch hung
- Cuts to be aged for 14 days.

(ii) Four Star Carcass Pathway

There is only one four star carcass pathway. In addition to meeting the basic requirements, four-star carcasses should meet the following requirements:

- No more than 25% Bos indicus content
- Carcass aged for 5 days
- Carcass to be tenderstretch hung
- Statutory declaration that the cattle go direct from weaning to transport at the abattoir
- Maximum ossification score of 130
- Minimum carcass weight of 140 kg.
- No weight for maturity score requirement.

Four Star Vacuum Packed Pathway

There are two approved pathways for four star vacuum-packed products. The special requirements for these two pathways are as follows.

Pathway 1

- No more than 25% Bos indicus content
- Carcass to be hung by the Archilles tendon
- Cuts to be aged for a minimum of 21 days
- A marble score of one or above*

Pathway 2

- No more than 25% Bos indicus content
- Carcass to be hung by the Archilles tendon
- Cuts to be aged for a minimum of 21 days
- A marble score of two or above.

* A marble score is a subjective assessment of visible fat within the muscle according to the AUS-Meat Standards.

(iii) Five Star pathway

There is only one approved pathway for five star products. The special requirements to achieve a five star rating are:

- No more than 25% Bos indicus content
- Carcass to be hung by the Archilles tendon
- Cuts to be aged for a minimum of 21 days
- A marble score at three or above

Driven by Consumer

MSA is consumer driven in the sense that grade standards are determined by consumer perceptions defined through product testing. This system describes and differentiates the eating quality characteristics of beef based on palatability. Even though participation in this scheme is voluntary, once an individual has joined he/she is required to comply with the MSA-specific requirements. The grading system is monitored, information is delivered up the supply chain, and there are financial rewards (higher prices) provided to the participants who achieve the specifications for a quality grade. Another notable feature of the MSA grading system is that it suggests the method for cooking to meet the specified palatability of that product. If one does not follow this method, the specified tenderness is not guaranteed.

Integrity of the System

The MSA grading system satisfies consumers' needs in terms of eating quality by controlling aspects of the production, slaughter and processing stages. In other words, the system is based on the concept that the eating quality of meat is a function of all the activities involved in the production of beef from 'gate to plate'. It involves the use of best practices and the involvement of breeders, processors, retailers and even restaurants. This is in contrast to the pre-existing grading system in Australia, which simply relies on the measurement of carcass traits using chiller assessment criteria. Thompson (1998), noted that the chiller assessment criteria is a poor measure of eating quality.

The MSA incorporates activities all along the production-marketing chain that are thought to impact on eating quality. These include genetics, pre- and post-weaning treatments, pre-slaughter handling, post-slaughter treatment, and processing of the carcass to achieve the desired quality of the final product. MSA uses *pathways* from producer to consumer and the establishment of critical control points along the pathways, which affect eating quality. It requires monitoring and documentation at each critical control point to ensure the palatability requirements are met.

The Consumer Testing Protocol / Meat Quality Score (MQ4)

A consumer testing panel or protocol is used to assess beefsteaks for tenderness, juiciness, flavor, and overall acceptability and represented as MQ4. This MQ4 score is used to evaluate the carcass pathways for different grades of beef. The testing procedure involves bringing together untrained consumers who are given an assessment of steaks, prepared and cooked in a standard manner. Consumers are recruited from various places, such as sporting clubs and other organizations to participate in the testing panels. Because of the inherent variation of rating between consumers, at least 10 consumers are used to test steaks from each animal and each group of consumers is used for only one testing. It requires at least 18 animals to be tested to validate a new pathway. Therefore, in total at least 180 consumers will be recruited for the testing and at least 180 steaks are eaten for the testing. The cooking temperature is controlled since the eating quality of the steak depends on the method of preparation and cooking. The cooked steak is served to a testing panel which is instructed to chew at least three pieces of meat before giving a rating by placing a mark on a 100 point line for tenderness, juiciness, flavour, and overall acceptability. These variables are then weighted according to their importance for palatability and combined together to form a single measure of palatability called the Meat Quality Score (MQ4). However, there is no detailed information about the establishment of weight for these different factors. Since the tenderness of meat is the major factor affecting palatability, it receives the highest weight of 0.4, while juiciness, flavour and overall liking receive of 0.1, 0.2 and 0.3, respectively. That is:

MQ4 = (Tenderness * 0.4) + (Juciness * 0.1) + (Flavour * 0.2) + (Overall liking * 0.3).

In addition, the testing panel is also asked to grade the meat as three star, four star, five star, and no grade.

The MSA uses this MQ4 score to categorize beef into the different grades. Beef with an MQ4 score between 48 - 64 is graded as three star beef while beef with an MQ4 score between 64 - 80 is graded as four star beef. Beef with an MQ4 score above 80 is graded as five star beef. According to this grading system, the five star beef is the best quality beef and is known as gourmet standard beef. The four star beef is succulent tender beef suitable for special dishes or casual entertaining. Three star beef is superior tender beef suitable for everyday meals or casual entertaining. The beef with MQ4 score less than 48 graded as no grade beef.

Palatability Analysis at Critical Control Points (PACCP)

The term PACCP is used to describe the new grading system. PACCP is the method used to identify those points in the production system, which have the largest effect on palatability. Figure 3.1 below shows the critical points in the MSA grading system. These points are then controlled to accurately predict the quality of the final product. The most important control points are genetics, nutrition/environment, pre-slaughter factors, post-slaughter treatments, processing/value adding, and cooking. Of these, pre-slaughter, post-slaughter and chilling are identified as having the greatest impact on eating quality.

The major advantage of this PACCP system is that it is possible to identify multiple pathways to achieve similar eating quality products. As discussed above, there are three approved pathways to produce three star vacuum-packed products. By having the price differential between these grades and different production/ processing pathways to achieve different grades, producers can choose the right option to obtain the highest returns on their investment.

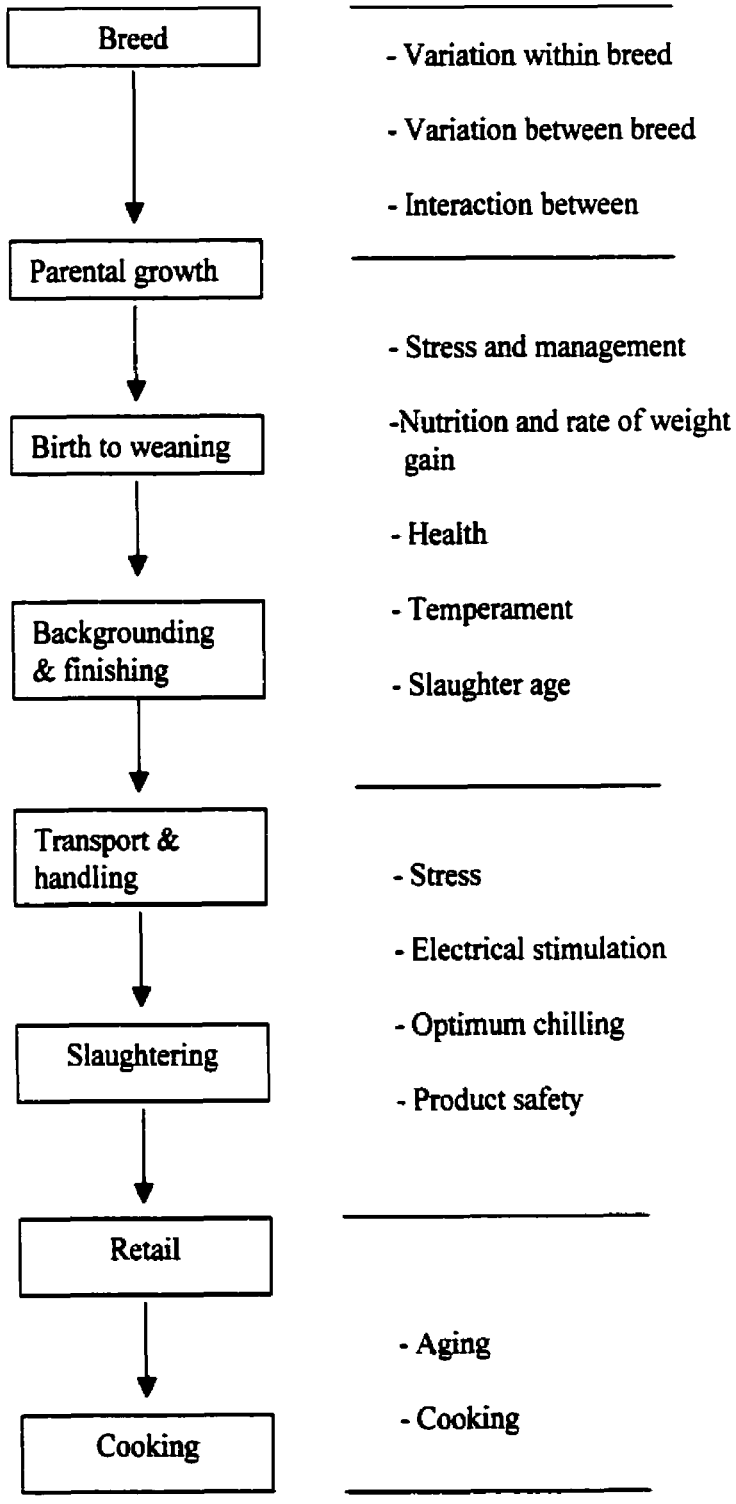


Figure 3.1 Palatability Analysis at Critical Control Points

The MSA Database

The MSA maintains its own database consisting of information about an animal's background, details of feeding, slaughter, carcass measurements, processing, and any treatments applied during pre and post slaughter. This information together form the MSA database, which in turn is used for assessing the usefulness of different production and processing practices to predict beef's palatability and therefore, the different pathways to produce different quality grades.

Arrangements of the MSA System

The MSA PACCP system works at the three main levels of the supply chain: (a) farm level; (b) producer/feedlot level; and (c) processor level as follows.

(a) At the Farm Level

Genetics, animal welfare and nutrition are considered to be critical factors at the farm level in the MSA grading system. Although MSA does not distinguish between any of the British, European, or Afrikaner breeds in its basic requirements. it does impose a limit on the level of the Brahman and Bos Indicus content allowed to attain a grade. The Bos Indicus content is the most contentious of the MSA scheme. because it tends to increase the variability in eating quality. Researchers have demonstrated that carcasses with greater than 75 percent of Bos Indicus content had a palatability failure of 65 percent compared to those carcasses with less than 25 percent of Bos Indicus content which only had a failure of 11 percent. Research is currently underway to estimate the tolerable amount of genetic variation of cattle.

(b) At the Producer / Feedlot Level

In MSA, the producer/feedlot must be able to provide the abattoir with cattle meeting the following specifications:

- be under 30 months of age ('A' maturity),
- have received reasonable nutrition to achieve weight for maturity factor of at least 0.6 kg/day,

- have a minimum fat depth on the ribs of 3 mm and some marbling for 4 and 5 star grades,
- transport to the abattoir without stress and mixing groups.

The producer/feedlot is required to declare that the necessary requirements are met in a written statutory declaration, which is subject to audit.

(c) At the Processor Level

MSA graders work in abattoirs on a fee for service basis. These graders are trained to identify the key factors considered to affect eating quality. Having already determined live animal factors, grading is undertaken by these accredited graders to include:

- Carcass marbling score,
- Maturity by ossification (<30 months),
- Minimum rib fat content at 12/13 rib (3 mm),
- Ultimate pH of 5.7 or less,
- Tenderstretch or Achilles hung,
- Then minimum aging is determined.

Further, these graders examine the DNA sample from each carcass they graded. Chillers are inspected and the grade is notified to the vendors.

3.5 Conclusion

The beef systems examined in this chapter show that different beef systems are evolving in different parts of the world. Beef systems in North America, especially in the US, vary from open markets to fully integrated markets. The Angus beef system uses strategic alliances in order to guarantee quality and consistency of the beef. The Angus beef system uses only registered packers, processors, wholesalers, retailers and restaurants to process and sell the product. The Farmland Supreme Beef Alliance uses several options for producers to retain ownership of cattle through the beef supply chain. Accordingly, those producers who have decided

to keep ownership will earn the marketing premium. This program also provides carcass information from the packing plant and feedlot to the producer. Quality assurance starts at the feedlot, selecting cattle with higher Angus content but there are no monitoring activities at the farm level.

The Harris Ranch Beef Company is a fully integrated operation. It produces beef under the USDA Residue Avoidance Program and monitors cattle from ranching to the retail level. The integrity of the system allows this company to produce beef with consistent quality.

The recent initiatives in the Australian beef industry aim to assure the palatability of meat by controlling the critical control points in each segment of the beef supply chain. This is called Palatability Analysis at Critical Control Points (PACCP), which was discussed under the section 3.4.2. This system takes into account both the animal health and the factors affecting palatability of meat.

The initiative undertaken in Australia is a 'farm to plate' approach to improving producer response. The first initiative (Marketlink) is an "exclusive" approach in which quality response can be enhanced through the systematic encouragement of vertical and horizontal supply chains. These will tend to be exclusive in the sense that beef producers who meet the requirements for partnership may join the supply chain while those who do not meet the requirements will be excluded. The second initiative (Meat Standards Australia) is an "inclusive" approach in that all beef producers may participate. Those cattle which do not meet the requirements for the quality grades (three star, four star or five star) are entered into the ungraded pathway. While the two Australian initiatives have been presented as alternatives, they are not necessarily mutually exclusive. It is quite possible for exclusive supply chains to integrate MSA into their operation.

The primary purpose of the present beef grading system is to separate cattle carcasses into uniform groups to facilitate marketing into different markets. It is clear from the foregoing discussion that both the Canadian and the US beef grading systems are based on carcass assessment criteria at the chiller. Although the Canadian and the US systems guarantee animal health and safety, they do not control

the factors affecting the palatability of meat. Both the Canadian and the American beef grading systems emphasize only on farm level factors which may affect eating quality of beef. This approach does not, take a whole-of-chain approach to producing meat which responds to consumer taste and preferences.

The Australian beef grading system, MSA, places much emphasis on consumer preferences in grading beef. The MSA is able to provide consumers with consistent high quality beef. The MSA involves measuring beef palatability, determining the factors that impact on palatability, introducing a program of quality assurance at critical control points, and maintaining integrity of the system. At the farm level, genetics animal welfare and nutrition are considered to be critical factors in increasing meat quality. At the feedlot level, operators are required to declare that the necessary requirements are met. MSA accredited graders provide a grading service at the abattoirs. By adding carcass information to the information provided by caw-calf and feedlot operators, the graders separate carcasses into different grades.

The national cattle identification systems which are presently evolving in different parts of the world are another step towards animal health and food safety. In fact, the major beef producing countries such as the EU, Australia, New Zealand, Canada and US are moving aggressively to implement cattle identification systems. Although this system helps facilitate protection of animal health, food safety, markets and consumer confidence, it does not guarantee that the product meets consumer's evolving tastes and preferences.

Canada, together with other beef producing countries faces the prospect of producing for an increasingly sophisticated consumer in an increasingly differentiated and competitive marketplace. Thus, the Australian experience provides an overview of what one country is doing to be consumer-responsive. We need to continually look for new ideas on how to generate quality systems that are focused firmly on what the consumer wants. Therefore, it is much more important for Canada to look for possible alternatives to improve its competitive ability in the

evolving international beef market. One possibility is to take a whole-of-chain approach to beef production.

It is difficult to know where the Saskatchewan beef industry is at in terms of its vertical coordination in an absolute sense as well as in comparison to the United States and Australia. It will not be possible to answer this question but it is possible to investigate the situation which exists in the Saskatchewan beef industry. The critical question which is examined in this study is how ready are Canadian producers, especially the cow-calf producers, to accept a vertically coordinated industry in general and to accept the kind of vertical coordination envisaged in Marketlink and the kind of quality assurance specifications required in Meat Standards Australia. Chapter four outlines the theoretical framework, which is required to investigate this question.

CHAPTER 4

THEORETICAL FRAMEWORK

4.1 Introduction

The purpose of this chapter is to present the economic theory upon which this thesis is based. Relevant literature is integrated with the theoretical framework because it enables empirical examples from real world situations to be discussed with theory. The decision-making process which cow-calf producers follow is outlined, beginning with the concept, definition and different types of vertical coordination (Section 4.2). In section 4.3 the economic rationale for why the world is moving towards more vertical and horizontal coordination is discussed. This follows the discussion of transaction cost economics, which provides the theoretical basis for the thesis (Section 4.4).

The goal of this chapter is to present a framework for rational decision-making by the cow-calf producer, thereby providing the economic rationale for the methodology presented in the next chapter. If an industry is to be more closely vertically coordinated, the parties to this decision (i.e., buyers and sellers) at each traditional market structure must be willing to adopt this structure. What factors cause this structural change? What is the process? This study, although it will not fully answer all these questions, examines the current attitudes and opinions of cow-calf producers towards increased vertical and horizontal coordination.

4.2 Concepts, Definitions and Different Types of Vertical Coordination

4.2.1 Concepts and Definitions

Renewed interest in the organization of business activities has been stimulated by improvements in production technology, communication and transportation. This has been further strengthened by globalization and the reduction of trade barriers in most economies around the world.

The production of goods and services involves many technically different stages. According to Mighell and Jones (1963), an economic stage in production is:

> *"Any operating process capable of producing a saleable product or service under appropriate circumstances"* (p.7).

One stage of production may be a part of a total process of production where no sale of the intermediate product occurs. Firms may, therefore, consist of many vertical stages or a single stage of a longer production sequence. The array of these individual production stages in chronological order of occurrence will result in vertical stages of the whole production process. For the beef industry, the organization of individual stages of beef production such as cow-calf, backgrounding, finishing, processing and wholesale/retail is the vertical array of the beef production continuum. For a cow-calf operation, the cow-calf producer is the firm and the number of calves produced is the output. Therefore, the term vertical coordination for the beef industry may include all the ways in which the vertical stages of this production process are controlled and directed.

Vertical coordination is also referred to as the concept of supply chain management. This has emerged as a rational business response to the changing national and international economic environments. Pinnacle Management (1998) defined supply chain management as:

> *"the management of the multiple factors that result in efficient flow of products and services from primary producer to the consumer"* (p. 24).

This may involve the integrated management of all the stages of production to produce goods and services desired by the consumer. Mighell and Jones (1963) refer to this as vertical coordination. They define vertical coordination as:

> *"the general term that includes all the ways of harmonizing the vertical stages of production and marketing"* (p. 1).

These authors further describe alternative means of coordination through vertical integration, contracting or other forms of cooperation singly or in combination. King (1992) defines vertical coordination as:

"the alignment of direction and control across segments of a production or marketing system" (p. 1217).

Royer (1995) emphasizes the importance of vertical coordination to link production processes to the consumers as:

> *"Vertical coordination, either through ownership integration or contractual arrangements, is necessary to link production processes and product characteristics to the preferences of consumers and processors"* (p. 473).

Vertical coordination can be achieved through the direct acquisition and control of different segments of the production process via vertical integration or through formal or informal contract between independent firms.

Frank and Henderson (1992) see vertical coordination as:

> *"Vertical coordination encompasses all means of harmonizing vertically interdependent production and distribution activities ranging from spot markets through various types of contracts to complete integration"* (p. 941).

Institutions that foster vertical coordination are common in agriculture. For example, a farmer owned cooperative is a form of horizontal coordination to enhance and coordinate markets for farm inputs and farm outputs. Although members of the cooperative continue to operate their farms as separate businesses, they agree to join together in certain stages of the production process. As an organized group these cooperatives could integrate backward to produce or purchase inputs. They could also integrate forward to distribute farm products. The contractual arrangements between cow-calf producers and backgrounders/feedlot or packers with feedlots are good examples of the increasing vertical coordination in the beef industry. These arrangements can help ensure suppliers access to specialized expertise, information, inputs and output markets. The following is a discussion of different types of institutional arrangements towards vertical organization of firms.

4.2.2 Different Types of Vertical Coordination

As defined by Mighell and Jones (1963), vertical market systems can range from remote open market transactions to vertical integration. Thus vertical

coordination captures not only the features of vertical integration but also the entire process of institutional arrangements, which can exist within the whole supply chain.

(a) Spot or Open Markets

At open markets, goods are exchanged between large number of buyers and sellers and the price is the sole determinant of the transaction. Auction markets, stock markets and most consumer purchases at supermarkets are examples of open market transactions. In these markets if sellers want to obtain price premiums they would attempt to understand the purpose of buyers and take these into account in their production and marketing practices. Buyers would reflect their responses by offering higher prices for those commodities, which closely meets their requirements. Thus market signals can be transmitted from buyers to seller, but this process is often not clear. Does the seller fully understand what it is exactly the buyers wants? Do sellers discuss with buyers what it is they will pay higher prices for? Do prices accurately convey all necessary information about product characteristics of importance to buyers?

(b) Contract

Exchange of goods and services through contracts is one of the alternatives to overcome the problems associated with open market transactions. Contracts set out the specifics of what the buyer wants and the seller agrees to meet these specifications. Once the contract has been made both parties are obliged to follow the terms of the contract. That is, the seller should produce and make available the product on time and to product specifications, and the buyer then should be obliged to buy them according to the agreement. In this market alternative, it is more likely that sellers know the prices that they will receive for their product prior to the sale. Furthermore, contracts provide market assurance not only for producers but also for buyers and reduce the price uncertainty for both parties.

Mighell and Jones (1963) classified contractual arrangements into three types: (i) market-specification contracts; (ii) production management contracts; and

(iii) resource providing contracts. In market-specification contracts, the producer transfers part of the risk and management function to the contractor. The producer becomes more certain of his market and the price, or the basis for computing the price. Although production management contracts are much similar to market-specification contracts, it calls for more direct participation by the contractor in production management. This management usually takes the form of resource specifications and field inspections during the production period. These types of contracts are more likely to occur when quality is important to the buyer. Resource providing contracts are more complex than the other two types of contracts discussed above. In resource providing contacts, the contractor provides not only the market and participation in production but also provides important inputs needed for the production. Therefore, the contractor usually controls production closely to avoid possible loss of inputs. As a results the contractor claims most of any profits.

Contractual arrangements therefore by-pass spot market transactions. These arrangements may be for a limited duration. Furthermore, the number of actions and decisions involved in contractual arrangements are fewer and firms maintain their businesses as separate identities. These arrangements can be for market specification contracts for output or to obtain inputs for his enterprise. The contractual arrangements in turn reduce the risk involved with transactions for both the buyers and sellers because producers received an agreed price for their cattle while buyers received cattle as agreed in the agreement.

(c) Strategic Alliances

A strategic alliance is an agreement between two independent firms to serve a common strategic objective. The alliances may lead to informal agreements based on trust and dedication, and are an intermediary form between open market transactions and vertical integration (Sporleder, 1992). This is more flexible than contractual arrangements. For example, a cow-calf producer might reach an agreement with backgrounders to secure the market for weaned calves with certain quality such as genetics. The backgrounders in turn might reach an agreement with feedlot operators or with packers to secure a market for backgrounded cattle. However, strategic

alliances could also include traditional and formal patterns of vertical coordination among firms such as contracts or partnerships. Each firm has a stake in the outcome and performance of the alliance but firms do not necessarily become shareholders that commit equity capital to the relationship.

The notable feature of alliances is that they presume mutual obligation. Sporleder (1992) stated this as:

> *"Firms in an alliance tend to feel obligated yet the arrangement often is more flexible in that initiatives outside some original planned agenda are permissible or even encouraged"* (p. 1229).

Van Duren, Howard and McKay (1995) suggested the importance of non-contractual arrangements such as trust, dedication to the partner and mutual commitment to remaining independent as key factors to vertical strategic alliances. According to these authors, trust facilitates discussion, increases the chance that business decisions in the two organizations will be aligned and thus reduce surprises. The supplier must be dedicated to satisfying the buyer's wishes and buyers must not shop for the lowest-cost supplier and must share the strategic information. The basic idea behind strategic alliances may be that quality standards and other performance criteria were easier to maintain through collaboration rather than through transactions with a wholly owned subsidiary. Mutual commitment to remaining independent signals the companies' intention to work together rather than compete.

An integral element of this is the establishment of alliances between organizations that collectively make up the chain. The two different forms of alliances are horizontal and vertical. Horizontal alliances enable a particular group of smaller entities to apply their collective strength and to negotiate their role as participants in the chain. Vertical alliances made up between collective groups of parties at the different levels in the chain provide the collective strength of the total chain to compete against other chains in the market place. Australia is one country that recently used this concept to reorganize its beef industry through developing alliances, i.e., Marketlink (see chapter 3 for more details).

(d) Vertical Integration

A vertically integrated firm consists of a firm owning more than one stage of production and/or processing/distribution. Such a firm has taken over the administrative control of all the stages. Joskow (1988) described vertical integration as a special form of diversification because it involves a direct relationship between all the stages of the production process. A firm can be integrated forwards into retail functions or backwards into supply functions.

Vertically integrated firms made decisions internally and transactions do not pass through an open market. Integration may be efficient in the sense of being a cheaper or better way of producing goods and services mainly because of reducing costs involved with transactions. Another purpose of integration may be to gain more profits by means of monopoly power and putting consumers and competitors at a disadvantage. A recent example is the new Maple Leaf hog plant at Brandon, Manitoba, purchasing Landmark, which is an integrated feed and hog production entity.

4.3 Economic Rationale for Why the World is Moving Towards Closer Vertical Coordination

Traditionally, open market prices derived through the forces of supply and demand were assumed to result in the most efficient means of directing the production of goods, services and distribution of available resources among alternative uses. This mechanism, however, can lead to inefficiencies and market failure because of the complexity of the mass production system (Mighell and Jones, 1963). Prices as sets of market signals for coordinating production at different stages in the complex mass production or "commodity" system do not always communicate clearly the specific production attributes desired by consumers (Collins, 1959). Barkema and Cook (1993) explain this situation as:

> *"price signals have become too fuzzy to guide the growers whereas production contracts are crystal clear in specifying the genetic, feeding programs, and management programs that will provide the homogeneous product required to meet the modern consumers' tighter specifications"* (p.54).

Some authors like Hurt (1994) see the changing structure of industries as a means of maintaining product consistency. Hurt emphasizes the need for product consistency as a primary force behind the changing structure of pork production. He further argues that the traditional system of the organization of firms needs to be supplemented or replaced by other coordinating arrangements to meet evolving consumer preferences. Some authors relate the changing nature of the relationship among firms to the risk associated with businesses. For example, Sporleder (1992) stated that the fundamental motivation for many of these exchange arrangements was attributed to vertical transmission of risk and management of absolute risks arising from prices, quality, or timing of delivery. Accordingly, vertical integration, contractual arrangements and strategic alliances became an alternative way of achieving coordination in successive stages of production and marketing.

In conventional economic theory, market power is treated as an incentive for the vertical integration of firms. The other incentives for vertical integration can include elimination of factor price distortions, elimination of successive mark-ups in the presence of imperfect competition, creation of entry barriers and price discrimination (Sporleder, 1992). Resource dependency is another explanation for vertical integration under the conventional theory of the firm (Grossman and Hart, 1986). This arises whenever a particular input represents a high percentage of total inputs and as a result the firm aims to manage the risk involved in acquiring the input. Robison and Barry (1987) note that contracting, integration, adjusting input/output levels, storage, hedging and insurance are the available managerial choices for firms in the presence of risks and are directly applicable to the beef industry. Contracting of packers with feedlot operators is an example of greater vertical coordination in the beef industry.

Kliebenstein and Lawrence (1995) state that the coordinated system allows individual participants to further improve their competitive position and eventually to achieve the long-term goals of the business. Kliebenstein and Lawrence point to greater vertical coordination and large operations through horizontal expansion of contracting as two major factors which contributed to the dramatic growth of the

pork industry in North Carolina. In this study, the authors considered different types of contractual arrangements such as different schemes of fixed payment with bonus, profit sharing and sole proprietorship (or independent ownership of the stages of production coordinated through traditional markets). Kliebenstein and Lawrence further argue that regional differences in types of contract producers (feeder pig producers versus feeder pig finishers) are a function of relative resource availability in various regions. The authors indicated that the primary reason producers enter into contractual arrangements is for risk reduction, lack of capital and to increase their income.

Some studies of vertical coordination focus on consumer demands, quality and food safety issues. For example, Hobbs and Kerr (1992) examined the impact of the UK Food Safety Act, which came into force in 1991 on the organization of the agri-food industry and potential changes in the organizational structure of the food industry. The authors found that an increase in monitoring costs for ensuring that food which conformed to the provisions of the Act would require closer forms of vertical coordination.

Hennessy (1996) explained market failure in conveying information about quality as a motive for increased vertical coordination. Levy (1985) also identified the failure of the market to transfer information from consumer to the producer as a motive for closer vertical coordination. Although this may have been true in the past, improvements in transportation, storage and information technology at present should have diminished many market clearing problems.

Teegerstrom et al., (1997) demonstrated the use of portfolio theory, which provides a framework to analyze the trade off between risk and return, to compare two alternatives: contract grazing and retained ownership in West Virginia. The results showed that an optimal portfolio consists of a combination of contract grazing and pasture rental, suggesting that contract grazing is a feasible component of the beef cattle industry.

Royer (1995) indicated that technological economies, transactional economies, imperfect competition and asymmetric information are factors which

cause industry participants to integrate vertically. Firms may have an incentive to integrate forward to capture downstream profits of the supply chain where the amount of processing, value-added and product differentiation are greatest. An upstream firm may not have an incentive to integrate forward unless it can purchase the downstream firm at a price that does not capitalize the value of future profits (Royer, 1995).

Boehlje (1996) claimed that the departure from spot market transaction activities to other forms of transactions such as contracting and alliances is partly responsible for the process of industrialization. Urban (1991) noted that agriculture in the western world is now entering the last phase of industrialization, which is the integration of each step in the food production system. In an article published in 1998, "Beyond Industrialization: The Prescription Food System" Urban went further and described the changing nature of food system as:

> *"The traditional commodity-based system is moving rapidly to a prescription system"* (p.43).

The explanation given for this is that consumer expectations for food are starting to include standards such as safety, health and environment.

In agriculture, the most important economic factors, which influence the vertical organization, are cost, efficiency, risk and uncertainty. Risk and uncertainty could arise with respect to input and output markets, prices, flows of perishable products and quality. All of these factors are directly applicable to the beef industry. Beef cattle prices are subjected to changing national and international market conditions such as trade rules, border restrictions and other type of agreements. On the other hand, beef cattle production is seasonal and if they are kept for a long time the quality of meat will be reduced because the age of cattle is one of the major determinants of beef quality.

In summary, the economic factors influencing the vertical organization of firms are the reduction of risk and costs, improving management practices, gaining bargaining power, improving market position, assuring adequate inputs, investing surplus reserves, developing new technology and obtaining additional capital. These

factors, however, are interrelated and not all of them are involved in each arrangement. Because of the increasing recognition that closer vertical coordination may offer a means of increasing the efficiency of production and marketing, this study assumed that the closer vertical coordination of the Saskatchewan beef industry may provide these efficiency gains while meeting the needs of the consumer.

4.4 Related Theoretical Concepts

Traditional neoclassical economic theory has failed to fully address the issue of market structures in particular firm conduct and behaviour, that is, how firms make their key business decisions. It is based on the assumption that economic actors have perfect knowledge about market conditions and operate in a fully rational manner. Neoclassical economics has tended to ignore the behaviour of economic actors, which can be critical in determining and achieving efficiency in production and marketing. That is, neoclassical economics did not attempt to examine the specifics of buyer – seller relationships. Recognizing these drawbacks, market structural economists attempted to develop a better understanding of the behaviour of firms. As a result, industrial organization theory was born.

Early work in industrial organization focused primarily on the "fairness and efficiency" of the marketing system. Bain (1968) measures fairness and efficiency of the market by looking at: (i) market structure (how a system is organized); (ii) the conduct (how decisions are made in a marketing system); and (iii) performance (how well the system works). He emphasizes that these three items are related to each other in such a way as to provide a 'picture' of the performance of a market. The way firms are organized in a market (structure) tells a great deal about how they make decisions (conduct), which in turn changes the level of efficiency and fairness present in the market (performance). In conclusion, Bain noted that if an economy wants to change the efficiency and fairness of its markets, all it has to do is alter the market structure.

The new institutional economics provides the basis for asking questions about market performance. It also provides the basis for the examination of market failure,

which is the major theme of the following section. This is in large part the focus of this study.

4.4.1 Transaction Costs Economics (TCE)

As discussed in chapter two, the beef industry is consolidating into larger operations. There tends to be an increased vertical coordination in the industry with large operators becoming either direct owners of lower links in the beef supply chain or making contractual arrangements with other industry members. This increased coordination results in contracting (written or verbal) problems, which are an important element of the reorganized beef industry. A discussion of TCE is therefore relevant to this study. The TCE is one branch of "New Institutional Economics".

The focus of TCE is to explain how firms are organized and how they evolve over time. The pioneering work on this subject dates back to 1937 when Ronald Coase published his paper on "The Nature of the Firm". In this paper, Coase explained why some transactions occur outside the firm while some occur within the firm. He recognized that there are some costs involved with transactions, which include the costs of discovering what prices should be, the costs of negotiating contracts and specifying the details of a transaction. Coase further explained that a firm will tend to expand until the costs of an additional transaction within the firm become equal to the costs of carrying out the same transaction on the open market. Therefore, this provided the rationale for the existence of the firm, which was based on the costs of carrying out transactions. However, until recently, TCE has been a neglected concept.

In the late 1970's, Oliver Williamson began to extend Coase's work. Williamson (1979) related vertical organization of firms with the new institutional economics known as transaction cost economics. This branch of economics adds more realism to the economic theory of the firm by recognizing that the costs incurred in the exchange of goods and services an aspect which neoclassical economics had previously ignored. This branch of economics explains that the

institutional arrangements in production and marketing would be bounded by open markets and vertically integrated firms.

Williamson (1979) explained the key issue as:

> *"if the costs of transaction were zero, there would be no any concern as to the organization of firms"* (p.233).

Frictionless exchange costs would lead to indifference towards the various organizational structures of firms because there can be no gain in completing particular transactions using specialized types of exchange such as contracts. Stated differently, the cost involved in transactions may encourage individuals to form different types of organizations within industries in order to reduce the cost of doing business.

As neoclassical economics has the two extremes of economic organization (i.e., monopoly and perfect competition), TCE also has its two extremes: open market transactions and vertically integrated firms. In vertically integrated firms, all the transactions occur within the firms whereas in the open market, transactions occur outside the firm. Between these two extremes, there are varying degrees of coordination, which include formal contracts and informal contracts. TCE theory helps to describe how and why these various types of organizational structures develop and evolve.

Williamson (1979) stated that bounded rationality and opportunism are two of the main causes for the existence of different type of organizations. Bounded rationality is one of the behavioural assumptions that causes individuals to behave within some limits. In other words, individuals make decisions based on limited information available to them. It also implies that although an individual may intend to make a fully rational decision, his ability to do so is limited by his own capabilities and information. Therefore, individuals spend time and incur costs in obtaining information for decision making.

Opportunism is the other behavioural assumption, which can affect the firm's organizational structure. It assumes that individuals will act in their self-interest. Williamson (1979) defined opportunism as *"self-interest seeking with guile"* (p.234).

That is, economic agents will sometimes act to exploit a situation to their own advantage. However, this will not imply that all individuals act opportunistically at all times but it recognizes the risk of opportunism. Williamson acknowledged the fact that when there is a smaller number of suppliers, the more likely it is that existing suppliers will act together to alter the terms of the business, such as increasing prices for their product, to their own advantage.

Based on these two behavioural assumptions. TCE economists incorporated adverse selection and moral hazard to this organizational framework. Binger and Hoffman (1988) explained adverse selection as:

> *"If different individuals have different intrinsic probabilities of sustaining losses, if there is no observable means of separating these individuals into separate risk classes, and if high risk individuals represents themselves as low risk, thereby reducing the payoff to another agent or agents, then we say that adverse selection exists"* (p. 539).

The same authors explain the existence of moral hazard as:

> *"If an economic agent can take an unobservable costly action which affects the probability distribution over outcomes or the actual outcomes themselves, then we say that moral hazard exists"* (p. 539).

TCE economists recognize that many economic activities occur in the environment of incomplete and/or asymmetrical information. This can lead to opportunistic behaviour and can be seen as adverse selection and moral hazard. Adverse selection is the situation where information is hidden prior to a transaction. Akerlof (1970) used adverse selection to explain the large price differences between new cars and used cars or those cars which have just left the showroom. His reasoning for this is that a seller may posses information about defects in a car but this information is not available to the potential buyer. Under this situation, the seller can act opportunistically by hiding this information from buyers. That is, the owner of the car (seller) knows the problems of the car but the buyer does not. The buyer may realize the problems of the car only after he has bought the car. This is adverse selection and it can occur whenever there is information asymmetry between two parties involved.

In a reorganized beef industry, cow-calf producers may make contractual arrangements with background operators and background operators may make contractual arrangements with feedlot operators. Feedlot operators in turn may make contractual arrangements with packers and so on. Therefore, the information asymmetry problem could result in adverse selection by buyers in any or all of these arrangements who have less information about the true quality characteristics of the cattle than the sellers.

Moral hazard will occur only after the transaction or contract has been signed. The insurance market is often provided as an example of the moral hazard problem. If the car owner did not purchase insurance, he is more likely to drive carefully to avoid accidents, which would result in financial loss. On the other hand, if he did purchase insurance, he knows that if the car is damaged in an accident the insurance will cover the loss. Therefore, he would be less concerned about driving carefully.

A similar example can be applied to the cow-calf producer when cow-calf producers attempt to make contractual arrangements with backgrounders or with packers. That is, if cow-calf producers have an agreement with buyers (backgrounders for example) to provide certain number of calves with specific quality characteristics (i.e. genetics), the cow-calf producers may not adhere to proper breeding, feeding and management practices. It is more likely that they would carry out practices that just meet the conditions of the contract or they may find some loop holes where they can save some money because they are certain that they could sell their cattle. This shows that the asymmetric information between two parties could lead to a problem of moral hazard when economic agents change their behaviour unexpectedly as a result of contracts or agreements.

Williamson (1979) discusses uncertainty, frequency and asset specificity as another set of important variables that determine the organizational structure of firms. Imperfect information and possible changes in the economic environment could bring uncertainty to the transaction which will finally affect the organizational structure of the firms. Williamson argues that a low level of uncertainty in a

particular transaction will result in spot market transactions. However, if a transaction involved highly uncertain aspects (i.e. quality standards), there tends to be a more formal type of vertical coordination such as written contracts in which one party can have more control over the outcome of the product.

The frequency of the transaction can play an important role in determining the organizational structure of the firm. Firms with high transaction frequency tend to reduce transaction costs by way of vertical integration and/or contracting (Barkema and Cook, 1993). Transactions with high frequency may involve assets which may be highly specialized and require large capital investments. Such investment may incur a high degree of risk of appropriability thereby changing the mode of transaction, for example, to written contracts.

Assets specificity is where one party has made an investment in assets specific to its transaction with another party. A product produced with non-specific assets, which has many alternative uses would tend to be sold in a open or spot market. As asset specificity increases, there tends to be more formal marketing arrangements such as written contracts or vertical integration to minimize the costs involved in transactions.

Williamson (1979) categorized asset specificity into three major categories: (i) site specific assets, (ii) physically specific assets, and (iii) human capital specific assets. Site specificity refers to the location of a firm. In Canada, the establishment of bigger slaughtering and packing plants in Alberta may be due to the availability of large feedlots and closeness to the US market. Furthermore, to reduce the cost of transportating live cattle, packers have begun to locate their plants close to feedlots. For example, western Canada feedlots began to be concentrated in southern Alberta with feeder calves moving there from Manitoba and Saskatchewan. The two beef plants at Highriver and Brooks, Alberta are located close to these feedlots. Therefore, much of the restructuring activities which have occurred in the beef industry in Alberta can be attributed to the site specificity of assets.

Physical asset specificity occurs when a firm makes an investment in particular equipment or buildings, which is specific to that firm. This type of

investment could increase the risk of the business because it could be a sunk cost. For example, building a packing plant, which invests in equipment specifically, designed to slaughter cattle or hogs.

Human capital specificity refers to the human skill required for certain transactions. If a particular activity requires trained or skilled labour, then this transaction can be thought of as human capital specific asset. This could also lead to specialization of activities within a firm. An example is the skilled labour required for identifying good animals or the skilled labour needed to operate a particular machine. This skill may be difficult to replace especially in the short run and it is a highly valued asset to the firm.

The investments made in assets can be divided into varying degrees of specificity: (i) non-specific; (ii) mixed; and (iii) idiosyncratic. Non-specific investments are used to produce a variety of outputs. Mixed investments are more specifically designed for a particular production process, while idiosyncratic investments are highly specific to a particular product. As assets becomes more idiosyncratic, there will be an increased tendency to organize the transaction with some type of governance structure other than spot markets.

The governance structure of a particular industry could depend on asset specific investments and the frequency of transactions. Combining three types of asset specific investment discussed above with the two types of frequencies of transactions of recurrent and occasional, the six types of transactions can be observed (Williamson, 1986) (Figure 4.1).

As shown in Figure 4.1, purchasing non-specific assets such as standard equipment or raw materials on occasional or frequent basis could occur in the open market. At the other extreme, the exchange of a site-specific intermediate product across the successive stages is highly asset specific and occurs more frequently. The more appropriate governance structure for this type of transactions is the fully integrated coordination structure where all the transactions take place within the firm. The other combinations of asset specific investment and frequency of transactions

		Investment Characteristics		
		Nonspecific	Mixed	Idiosyncratic
Frequency	Occasional	Purchasing Standard Equipment	Purchasing Customized Equipment	Constructing a Plant
	Recurrent	Purchasing Standard Material	Purchasing Customized Equipment	Site-Specific Transfer of Intermed. Prod. Across Stages

Source: Williamson, 1986

Figure 4.1 Illustrative Commercial Transactions

could result in different types of contractual arrangements between firms. Purchases of customized equipment on an occasional basis means that the transaction involves a somewhat specialized investment. The most appropriate governance structure for this type of transaction may be the contractual arrangements to reduce risk. Purchasing customized material on a frequent basis could lead to some form of joint venture which may be equally thought of as quasi-integration. This form of relation between two parties is somewhat flexible but it reduces the incentive for either party to act opportunistically.

The construction of a plant is an occasional idiosyncratic transaction. Again the most appropriate governance structure for this type of transaction may be the contractual arrangement. Once parties have entered into these arrangements, there is a high desire to complete the contract. An example associated with beef industry would be contracts for cow-calf producers to deliver a certain number of weaned calves to backgrounders or to feedlots, within a certain time frame, for some negotiated price. The weaned calves are somewhat specialized in the sense that they are ready to enter the backgrounding stage of the growth cycle and both parties do have a commitment to complete terms of the agreement. Therefore, this shows the

different vertical coordination arrangements could occur with different types of transaction costs involved with the transaction.

4.3.2 Transaction Costs

The studies related to the choice of supply channels indicate that transaction costs (the costs involved in the exchange of goods and/or services), which arise from information asymmetry is a major factor determining the appropriate supply channel (Williamson, 1986; Hobbs, 1996a, 1996b; Wilson, 1996). Levy (1985) defined transaction costs *as "the cost of organizing the economic system"* (p. 438). As discussed above, different types of buyer-supplier relationships would emerge primarily due to the costs involved in transactions. For example, contractual arrangements between producers and processors and/or retailers may reduce such transaction costs (i.e. monitoring costs).

Transaction costs could arise basically in any form of economic organization such as spot markets, contractual arrangements, or joint ventures which could alter the market price and quantity sold in the market. Suppose a supply and demand curve for a particular product is as shown in Figure 4.2. Also assume that there are

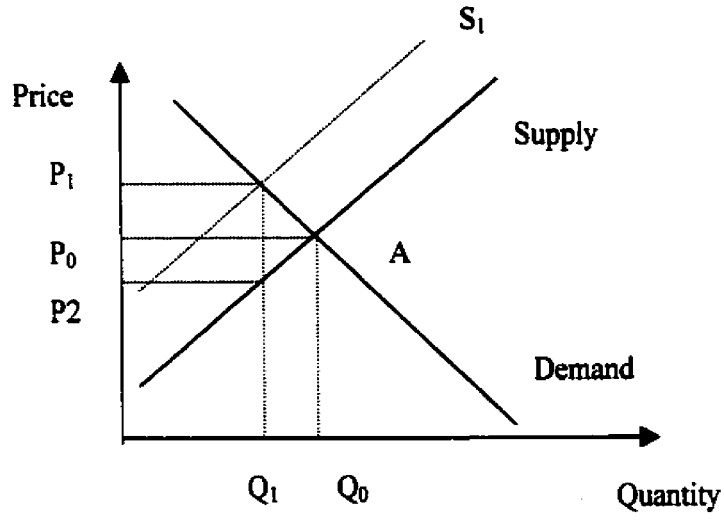


Figure 4.2 Market Equilibrium with Transaction Costs

no transaction costs involve in this hypothetical market. Then the market equilibrium results at A where equilibrium price is P_0 and quantity is Q_0.

The existence of transaction costs results in shifting the supply curve to the left as denoted by S_1. The resulting market equilibrium price is P_1 and quantity is Q_1. This shows that the existence of transaction costs raises the net price paid by the consumer and reduces the net price received by the seller. At the same time it reduces the quantity traded in the market, while increasing the market margin. In this case P_1- P_2 is the amount of transaction costs involved and $Q_0 - Q_1$ is the reduction in volume traded.

Williamson (1979, 1986) noted the type and level of transaction cost is a major factor that determines the degree of vertical coordination of firms. Accordingly, any change in transaction characteristics such as frequency, uncertainty, asset specificity will alter the transaction costs, which may then change the organization of the supply chain.

4.3.3 Different Types of Transaction Costs

Hobbs (1996b) divided transaction costs into three major categories: (a) information, (b) negotiation, and (c) monitoring and enforcement costs.

(a) Information Costs

The costs involved in obtaining data and processing it into information about products, prices and customers (or markets) are the costs, which arise prior to the transaction. For example, cow-calf producers incur costs in obtaining information about breeding stock (cows and bulls) with desired characteristics or finding backgrounders/feedlot operators to sell weaned calves. If the backgrounders or feedlot operators are risk averse, then they will buy calves from sources with known producers who produce consistent quality calves. Therefore, a major portion of these information costs is attributed to the activities involved in establishing a contract with suitable buyers and sellers.

Stigler (1961) pointed out that the time dedicated to looking for information depends on the costs for additional search and gains from additional search. If a gain from additional search is more than the additional costs, sellers (or buyers) spend more time in searching buyers (or sellers). The optimum search is the point where the additional cost of a search is equal to the expected marginal benefits of the search.

Barzel (1982) noted that information costs could occur whenever the transaction involves the valuing of non-visible attributes of a product such as quality characteristics. Barzel uses oranges as an example to show that the impossibility of measuring the taste and amount of juice an orange contains accurately from visual inspection of the orange. This implies that measurement of the desired attributes is costly. A producer of oranges may be more knowledgeable than the consumer about the quality attributes but the producer may gain from this situation by behaving opportunistically (hiding information).

The costs involved in valuing non-visible attributes could vary depending upon the errors that could arise from subjective measurements by individuals. This in turn results in differences between the posted price and the valuation of that good by individual buyers. For example, a cow-calf producer may possess information about genetics, quality of feed and veterinary care whereas the buyer (feedlot for example) is unlikely to have this information. Therefore, the feedlot operator incurs costs in measuring and sorting calves into different quality categories. The implication of high measuring costs to the buyer means that he is not prepared to pay the posted price of the seller. On the other hand, if the seller incurs the costs, he could do the sorting at one time because he is more knowledgeable about the quality of the product than the consumer. Therefore, in situations where it is difficult to measure the true value of a product visually, sellers can reduce the measuring costs of buyers by sorting the goods and providing the buyer with a guarantee as to the true quality of the product. The use of warranties and/or brand names such as Certified Angus Beef, are the alternative ways of reducing information costs to the buyer. The economic rationale behind the brand name is the that loss to a seller arising from the

sale of a low quality product would be large since reputation of a brand name will be lost.

(b) Negotiation Costs

Negotiation costs arise from the physical exchange of goods or services. For example, the payments made to the sales staff, the costs of writing contracts and commission charges are the costs involved in the negotiation of the transaction. This type of cost may be higher at the initial negotiation but it will fall once the relationship is established. An increase in the number of negotiations would increase the transaction costs but it could bring an additional advantage being able to renegotiate the price and to reduce the level of risk because of the trust developed through previous transactions.

(c) Monitoring and Enforcement Costs

Monitoring and enforcement costs arise after the transaction is carried out. Monitoring helps reduce the risks associated with moral hazard. In other words, it helps ensure the terms of the transaction or contract are met. In addition, quality requirements and the ability of the firms to monitor activities will also influence the importance and effectiveness of monitoring activities in reducing risk. This also avoids the costs involved in finding new buyers or the costs related to information in the case of loss of customers by not meeting the specifications of the contract. An example for this is not supplying calves with good genetics as agreed to in the contract or not following the veterinary care procedures agreed to in a contract.

4.3.4 Transaction Cost and Optimal Choice of Contract

An underlying notion of TCE is that an individual considers production costs and transaction costs when making production decisions and tries to minimize both. TCE suggests that internalizing activities within a firm would lead to a reduction in transaction costs. Zwart (1998) developed a transaction costs model to identify the variables that are likely to influence the choice of governance structure and used it to

illustrate the relationship between transaction costs and marketing channel choices. The independent variables in this model are information costs (search costs), monitoring costs and asset specific investment and the dependent variable is profit. Let us assume a particular firm (cow-calf producer in this case) that is consistent with a mean-variance utility model and the objective is to maximize expected utility of profit. That is:

$$\text{Max: } E[U(\pi)] = E(\pi) - \lambda \text{ Var.}(\pi) \tag{4.1}$$

where π is profit from sales and λ is the coefficient of risk

This mean-variance utility function is consistent with a utility function that is quadratic in π or an exponential utility function that has constant risk aversion and a normal distribution of π (Varian, 1990). This utility function gives a relationship between returns and risk. It also allows for varying attitudes to risk to be shown in single parameter, λ.

A firm's cost of production can be divided into two components: (i) real cost per unit of product (C) and, (ii) total hidden cost or transaction cost, R. Then the profit from selling commodity Q is:

$$\pi = Q(P_m - C) - R, \tag{4.2}$$

where P_m is the market price and Q is the quantity produced.

Zwart (1998) divided transaction cost (R) into several components such as search cost (S), monitoring cost (M), and asset specific investment (A). In this model, Zwart defined search costs as expenditures searching for a better price in each transaction. For example, an investment of time and money in searching for an appropriate price is likely to result in a reduced level of risk and higher level of price. The number of negotiations is assumed to measure the frequency with which contracts are renegotiated within a particular time period. Although an increased number of negotiations reduce the variance of risk, it eventually increases total search costs.

Monitoring costs is defined as the costs incurred in monitoring activities for the same time period. As discussed before, the expenditure on monitoring reduce the

risk associated with moral hazard. Monitoring is important especially in the case of contracts are generally related to quality requirements.

Specific assets are defined as those assets specific to a particular transaction. An investment in these assets is expected to increase the expected return but the impact on variability of return is not as clear.

Inclusion of these variables in equation (4.2) results in:

$$\pi = QP - (S.n + M + A) \tag{4.3}$$

where P = net of real cost ($P_m - C$), and n is the number of negotiations in a particular period of time.

Price risk can be included in equation 4.3 as:

$$\pi = Q\,(P^* + \varepsilon) - (S.n + M + A) \tag{4.4}$$

$$P^* = P\,(A) \tag{4.5}$$

$$\text{Var. } \varepsilon = f\,(S, n, M, A) \tag{4.6}$$

ε is assumed to be $\sim N\,(0, \sigma^2_\varepsilon)$

Equation 4.5 reflects the impact of investment in specific assets (say a particular supply channel) on net return. Equation 4.6 explains the impact of expenditure on different types of transaction on the variability of returns. The decision variables in this models are S, n, M, and A. Therefore, expenditure on these variables could have the effect of reducing the variability of expected return and may lead to an increase in the expected return.

Following Zwart (1998), substituting equation (4.4) into equation (4.1) results in:

$$E\,[U\,(\pi)] = E\,[Q\,((P^* + \varepsilon) - (S.n + M + A)] - \lambda\ \text{Var.}\ (\pi) \tag{4.7}$$

$$E\,[U\,(\pi)] = Q.P^* - S.n - M - A - \lambda(Q^2\ \text{Var.}\ \varepsilon) \tag{4.8}$$

where Var. $\varepsilon = f\,(S, n, M, A)$.

Taking first order conditions of (4.8) with respect to S, n, M, and A results in:

$$\frac{\partial[EU(\Pi)]}{\partial S} = -n - \lambda Q^2\ \frac{\partial f(S,n,M,A)}{\partial S} \equiv 0 \tag{4.9}$$

$$\frac{\partial[EU(\Pi)]}{\partial n} = -S - \lambda\ Q^2\ \frac{\partial f(S,n,M,A)}{\partial n} \equiv 0 \tag{4.10}$$

$$\frac{\partial[EU(\Pi)]}{\partial M} = -1 - \lambda\ Q^2\ \frac{\partial f(S,n,M,A)}{\partial M} \equiv 0 \qquad (4.11)$$

$$\frac{\partial[EU(\Pi)]}{\partial A} = Q\ \frac{\partial P(A)}{\partial A} - 1 - \lambda\ Q^2\ \frac{\partial f(S,n,M,A)}{\partial A} \equiv 0 \qquad (4.12)$$

These four first order conditions identify the trade-off which must be made in different forms of transaction costs. The identity (4.9) implies that the optimal search cost is dependent on the number of negotiations to be made. The identity (4.10) implies that the optimal number of negotiations occur when the average cost per negotiation is equated to the benefits from the reduction in risk associated with the negotiation. Therefore, the cost associated with information search is dependent on the average cost of negotiation and the number of negotiations. The identity (4.11) implies that each dollar spent on monitoring is equated with the marginal utility associated with risk reduction from that activity. The identity (4.12) implies that at the optimum, the cost of the specific assets is equated to the benefits of increased revenue and the reduction of risk. Zwart interpreted the implications of these results as:

> *"the factors influencing transaction cost expenditures are clarified as the problem that is normally stated as one of minimizing the cost of completing a series of transactions, has been restated as one of maximizing utility"* (p.452).

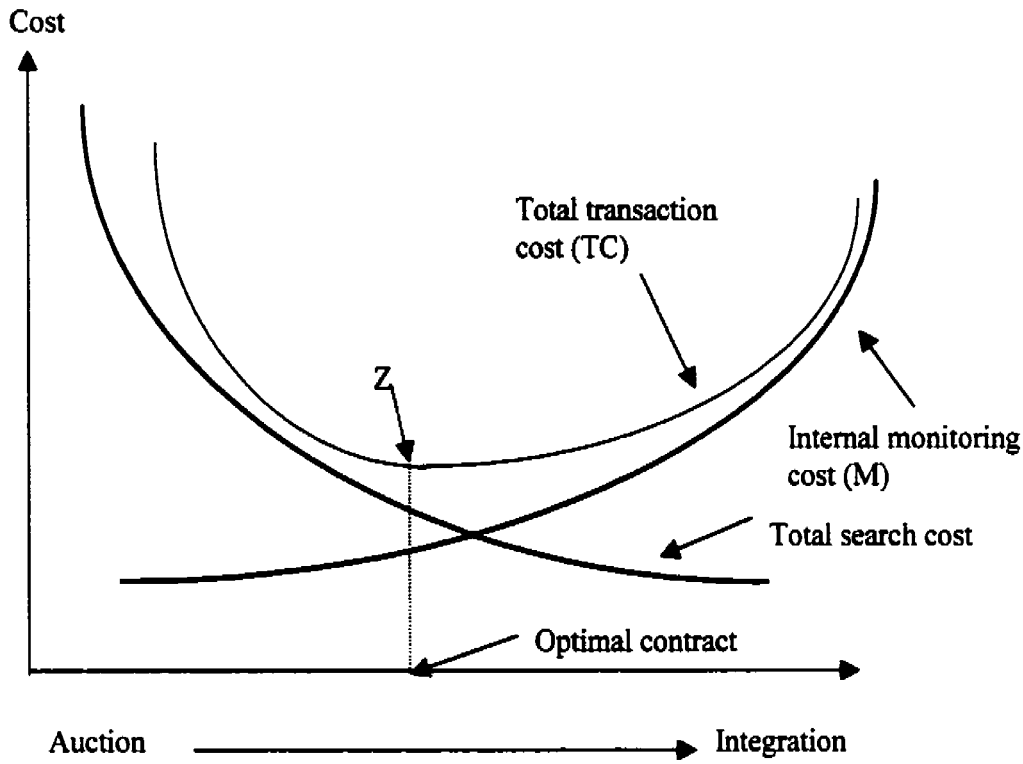
Although these specific set of variables may define an optimal choice for an individual firm, the author acknowledges the fact that difficulties arise in choosing actual supply channels and how these variables are linked to form a particular supply channel. He further argued that firms' decisions are more complex than simply the level of transaction costs and are linked to firms' attitude towards risk and the marginal impact of different type of transaction costs on risk.

In this model, λ represents the firm's attitude towards risk. Different firms may have different approaches to management of risk depending on the nature and the level of risk. This in turn has an impact on the channel that might be chosen and thereby the level of expenditure.

Although this model can not be used directly to explain different types of organizational behaviour, it does provides guidance to the types of variables that will influence marketing decisions. In examining this model, Zwart concludes that while the level of transaction costs expenditure is an outcome of the model, they may not have a simple relationship with the contractual arrangements. The contractual arrangement is the result of combining the effects of transaction expenditures and their marginal effects on return and risk.

Different forms of expenditure impact somewhat differently on the variability of returns. The impacts may vary with the market power that an individual firm might have in a particular market and the nature of product or service offered by the firm. For example, small firms may face a narrow range of marketing channels such as selling on commodity markets. Small firms may not be able to establish specific contracts because they cannot provide sufficient quantities of animals to make it worthwhile for a firm to contract with them. Large firms may choose to establish an independent marketing channel with a set of contractual relationships that is independent from other firms in the industry. These relationships may also be influenced by the ability of the firm to efficiently search or monitor each activity. For a cow-calf producer, the time and money spend in searching for the appropriate price will increase the probability of finding the highest paying buyer of the farm's products.

A particular supply channel may have clearly defined characteristics and types of transaction costs. For example, in an auction market there would be a large number of negotiations (n) and low levels of search costs (s). At the other extreme, a vertically integrated firm does not have search costs but there may be a substantial amount of internal monitoring costs. In between these two extremes, there could be a continuum or range of alternatives that reflect different types of vertical coordination. Figure 4.3 graphically represents the possible trade-off between internal monitoring cost (M) and search cost (S.n). The optimal organizational structure will occur at the point Z where total transaction cost is minimal. Therefore, TCE provides incentives



Source: Zwart, 1998.

Figure 4.3 Possible Trade-off between Internal Monitoring Costs and Search Costs and Optimal Contract

in the forms of reducing the time and money required for searching, monitoring and negotiating contracts. It also reduces the risk associated with input and output markets. However, it should be noted that in this model Zwart ignores the reduction of external monitoring costs, which may arise from vertical integration. Firms may choose to vertically integrate to reduce external monitoring costs. Therefore, it is possible that a reduction of external monitoring costs as we move from auctions to vertical integration may outweigh the increase in internal monitoring costs, ultimately resulting in a downward sloping total monitoring cost curve.

In summary, transaction costs arise whenever there is an exchange of goods and services. These costs can have different forms such as information, negotiation and monitoring/enforcement costs. The existence of these costs reduces the traded goods and services in the market, creating a gap between the price which consumers

pay and the price which producers receive. This price difference is the amount of the transaction costs involved. In situations of information asymmetry, market participants will take steps to reduce these costs through working together in the form of contracting, joint ventures and vertical integration and the use of warranties, branding and quality assurance guarantees.

Despite the growing literature on vertical and horizontal coordination in agriculture, little work has been carried out on the beef industry. Much of the research regarding supply chains is about the creation and management of vertical alliances and there is very little work on horizontal alliances but it is critical to the success of the chain. Mighell and Jones (1963) claimed that:

> *"Horizontal expansion must often be employed if the vertical expansion is to accomplish its purpose"* (p. 18).

The emerging innovative linkages among different sectors of an industry have to be analyzed to determine the impact on profitability and performance of a particular industry. The basic questions are: (i) to what degree does the Saskatchewan beef industry recognize the key issues and problems it faces?; (ii) do beef industry players in Saskatchewan have good information on industry performance variables?; and (iii) to what extent are they satisfied with the status-quo? This thesis attempts to contribute to an understanding of these issues and intends to identify major factors affecting cow-calf producers' attitudes towards vertical and horizontal coordination mechanisms. The next chapter focuses on the approach to developing the empirical procedures (tests) to examine the issues arising from the theoretical framework.

CHAPTER 5

EMPIRICAL FRAMEWORK

5.1 Introduction

The main purpose of this chapter is to describe the methodology used to evaluate producers' attitudes towards different industry coordination mechanisms. The chapter begins with a description of the questionnaire, which was used to collect the required data (Section 5.2). Conjoint analysis that was used to gauge producers' attitudes towards different coordination mechanisms is discussed in section 5.3. Section 5.4 discusses the product/service attributes and their levels within the cow-calf sector of the beef industry. Collection and tabulation of data is discussed in section 5.5. The final section (5.6) is a discussion of the method of data analysis and relevant links to chapter 6, which contains the results and analyses.

5.2 The Questionnaire

The questionnaire was designed to solicit information on producers' attitudes towards vertical and horizontal coordination. The questionnaire was divided into two major sections (Appendix A). The purpose of section A was to obtain information about respondents' production and marketing arrangements for their beef herds as well as their opinions on the importance of greater coordination in the beef industry. Questions related to: (a) number of breeding stock, (b) cattle raised and sold in the year 1998, (c) type of breed specialized, if any, (d) net income earned from beef cattle enterprise, (e) number of years in beef cattle production, (f) type of cattle sold (weaned, background, finish), and the level of satisfaction obtained from selling, (g) improvements needed for the current marketing system, (h) the changes made to the beef cattle enterprise in the last three years were included in this section. In addition,

three other questions were included to obtain producers' opinions on the importance of vertical and horizontal coordination for the beef industry.

Section B was designed to obtain their opinion about the future of the beef industry and alternative vertical coordination mechanisms. The questions included in this section were meant to obtain opinions of different vertical coordination mechanisms. Questions included in this section were related to (i) declining beef consumption, (j) options for improvements of Saskatchewan's beef industry; (k) future direction of the beef industry; (l) which sectors of the beef industry need improvements; (m) attitudes toward two different coordination mechanisms – Approximation of Marketlink and MSA; (n) contracting and price discovery; and (o) preferences toward different marketing arrangements. Respondents were asked to rate most questions in both sections on a 5-point scale according to their importance.

5. 3 Conjoint Measurements: An Overview

The purpose of this section is to explain the underlying methodological approach involved in conjoint analysis. Conjoint analysis is often used to measure buyers preferences for different product attributes. In this study, conjoint analysis was used to determine the preferences of cow-calf producers for different supply channels. The pioneering work on conjoint analysis dates back to the work of Luce and Tukey in 1964. Luce and Tukey stated that conjoint measurement is the existence of two real-valued functions that measure the effects of the two classes of variables in such a way that the overall effect is the sum of the effects of the two variables. Green and Rao (1971) were the first to apply conjoint measurement in consumer-oriented research. Since then many researchers have focussed on potential applications, theoretical considerations, validity and reliability of conjoint measurements. The purpose of the conjoint measurement in this study is to identify the combination of production and marketing attributes which gives the highest utility to the producer and then to establish the relative importance of attributes in terms of their contribution to total utility.

Green and Srinivasan (1990) explained that conjoint analysis is any decompositional method that estimates the structure of a consumer's preference given his/her overall evaluations of a set of alternatives that are pre-specified in terms of levels of different attributes. Ness and Gerhardy (1994) define conjoint analysis as a technique, which models the nature of consumer trade-off among multi-attribute products or services.

Conjoint analysis has been primarily concerned with the conditions under which there exists measurement scales for both the dependent and the independent variables. The basic principle of conjoint measurement is to emphasize the transformation of subjective responses into estimated parameters (Green and Wind, 1975, Green and Srinivasan, 1978). More specifically, consumers evaluate the value or utility of a product or service, which may be real or hypothetical, by combining the separate amounts of utility provided by each attribute. Respondents need not tell the researcher directly how important an attribute is because of the inherent ability of this technique to determine the importance of each attribute level, having only the respondent's overall ratings of the whole product or service. In conjoint measurements, the combination of factor levels to describe a product or service is known as a treatment or *stimulus*.

One important feature of this analysis is that it enables researchers to understand how respondents developed preferences for products or services (Hair, et. al., 1992). Another important feature is that researchers first construct real or hypothetical products or services (sometimes called profiles) by combining the possible attributes at various levels, and then it is presented to the respondents to give an overall evaluation. It is a decomposition approach where respondents react to a set of total profile descriptions (Green and Sirinivasan, 1978).

One of the key assumptions underlying conjoint measurement analysis is that an individual's preference for a product or service can be decomposed into individual components. In an application of conjoint analysis, a set of attributes is defined prior to the collection of the producer/consumer's judgement over product or services. Fundamental to the model of conjoint analysis are the assumptions that:

- the product or service can be defined as a set of attributes
- alternative ways to obtain the same product or service can be defined as a set of different attribute levels
- respondents evaluate the utility or preferences of a combination of attribute levels and
- respondents trade off combinations of attribute levels when choosing one from several alternatives.

One advantage of conjoint analysis is the flexibility of the model specification. The preferences can be either additive or interactive. The most common specification of the model is the additive part-worth model, which is the sum of the contribution from each component in the model. This approach assumes that the part worth of each attribute level is independent and total utility is the sum of the attribute level part worths. For example, assume four attributes, A, B, C, and D. Data on respondents' preferences for a particular product combining attribute level i from A, attribute level j from B, attribute level k from C and attribute level l from D are collected in a survey. Then respondents' preference for a particular product combining attribute levels i, j, k and l can be written as:

$$Pref_{ijkl} = a_j + b_j + c_k + d_l$$

Where $Pref_{ijkl}$ = the consumers' total utility or preference rating for a combination of product attributes a hypothetical good or service,

a_j = the utility or part-worth of attribute level i from attribute A

b_j = the utility or part-worth of attribute level j from attribute B

c_k = the utility or part-worth of attribute level k from attribute K, and

d_l = the utility or part worth of attribute level l from attribute D.

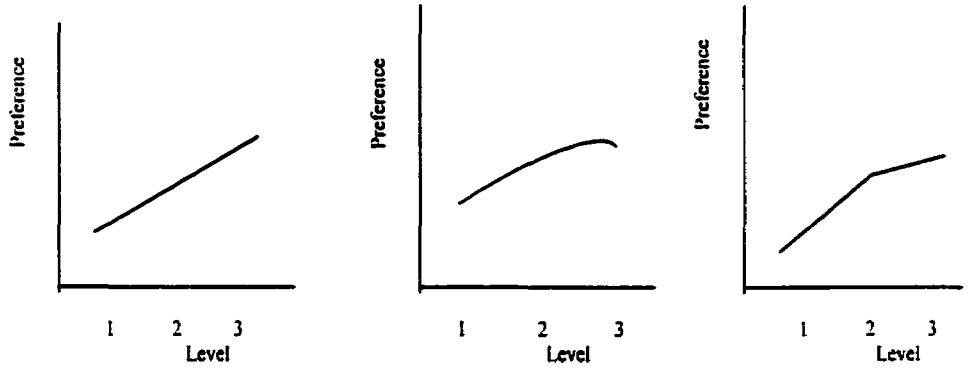
The second advantage of conjoint measurement is the possibility of incorporating both monetary and non-monetary factors, whereas the neoclassical profit maximizing framework incorporates only the monetary factors such as yield or income (Forson, Ntare and Waliyar, 1997). These authors pointed out that in making decisions, producers may be interested in non-monetary factors, such as risk involved in a particular supply channel, into their decision process thus making the utility

maximizing framework a more complete index of satisfaction than the expected profit framework. Essentially, conjoint analysis allows decomposition of individual evaluations of a set of multi-attribute alternatives into part worth utilities or values. The third advantage is its ability to transform simple ordinal data into stronger ratio measurements. A fourth advantage is the wide applicability of conjoint measurements in consumer oriented research. Finally, the conjoint measurement allow the estimation of preferences at the individual level and aggregate level.

Choosing an appropriate model and part-worth relationship are key to conjoint analysis. In selecting a model, how respondents combine each component of the attributes is important because it affects both the design (stimuli) and the assessment of the respondent's evaluation. The most commonly used rule for this purpose is the composition rule, which describes how the respondent combines individual components (part worths) of the factor levels to obtain overall effects for the product or service.

There are two-composition rules: (i) an additive rule and (ii) an interaction rule. A major assumption of the additive composition rule is that respondents "add up" the values of each of the attributes to get the total worth of a combination of attribute levels. The interaction composition rule takes into account not only the main effects but also the effect of interaction between attribute levels. Hair et. al., (1992), however, stated that there is not much to gain by adding interactive terms to the model. This is because the reduction of statistical efficiency (more estimates) is not offset by an increase in predictive power gained through the interaction terms. Empirical evidence suggests that the increased realism obtained by incorporating interaction terms is small in comparison with the loss in predictive ability caused by including additional parameters (Green, 1984). Although the interactive form may represent how respondents actually value a product or service, it requires comparatively more evaluations from the respondents. Carmone and Green (1981) pointed out robustness of the main effect models for conjoint analyses by dropping interactive terms from the model.

The relationship of the part worth within a factor (or attribute) can be of three types: linear (vector models), quadratic (ideal point models) or separate part worth (piece wise linear models) (Figure 5.1). The linear form is the simplest relationship



a. Linear b. Quadratic c. Part-worth

Figure 5.1 Linear, Quadratic and Separate Part-worth Models

of factor levels but it is most restrictive. It assumes the same coefficient for all the levels. That is, if we know the value for level one, then the value of level three is simply three times the value of level one. In the quadratic form the strict linearity is relaxed and, therefore, part worth can have different values depending on the levels. The separate part worth form or piece wise linear model is the most general, which allows each level to have its own part worth estimates. Green and Srinivasam (1978) noted that if the attributes are categorical, we are forced to use the part-worth models.

In conjoint analysis, data collection requires respondents to evaluate alternatives described in terms of a set of attribute levels. The most common methods used in data collection are the trade-off (or pairwise) method and the full profile methods (Hair et. al., 1992). The trade-off method uses two attributes at a time whereas the full profile method uses the full range of attributes. Although the trade-off method is simple, easy to administer and avoids overloading respondents with information, the practical use of this method has decreased dramatically over the last decade. This is mainly because of the problems associated with the large number of judgments (because evaluation is based on two attributes at a time) necessary for even a small number of attributes, a tendency for the respondent to get confused, its sole use of ranking (non-metric) responses, and its inability to use fractional factorial

design to reduce the number of comparisons. Ness and Gerhardy (1994) stated that the trade-off method has some weaknesses because in the real world, consumers are confronted with all attributes and when making choices they consider all attributes levels simultaneously and not in pairs.

The full profile method presents respondents with full descriptions of the product or service and requires them to rank or score each set of attribute levels according to their preference. The full profile method has an advantage over the trade-off method and has become more popular in most conjoint experiments. The ability to use fractional factorial design and a more realistic description of the attribute levels in each question is the most important characteristic of the full profile method. In the full profile method, respondents were faced with a situation as though they are in the real world. Another advantage of the full profile method is the possible use of more types of preference judgements. As respondents are exposed to a number of possible alternatives, they will be able to compare alternatives and rate according to their order of preference. Authors like, Green and Srinivasan, (1990); Hair et. al., (1992) recommended the full profile method when the number of factors or attributes are equal to or less than six. Reibstein, Bateson, and Boulding (1988) compared the reliability of the estimates obtained through full-profile and trade-off methods and concluded that the full-profile method generates more reliable estimates than the estimates obtained through the trade-off method. Some other authors like Jain et. al., (1979); Segal, (1982); Leigh, MacKay, and Summers, (1984), however. reported that there are no differences in the reliability of estimates obtained through the full-profile and trade-off methods. Furthermore, Carmone, Green and Jain (1978) proved the robustness of metric or rating analysis using the orthogonal arrays by carrying out a Monte Carlo experiment. Green and Srinivasan (1990) stated that orthogonal designs are very robust compared to other methods.

5.3.1 Conjoint Model

As discussed above, the decision-maker/firm is assumed to seek efficiencies in transaction costs. The firm is assumed to maximize profits/utility by choosing a

particular supply channel from the different alternatives available to the firm. In the theory of consumer behaviour, demand functions are derived from a model of preference maximizing behaviour. The economic literature suggests that the model of preference maximizing could apply not only to consumer theory. It could also be applied to several other areas such as evaluating producers' decisions, quality traceability and animal welfare, evaluation and design of modern crop varieties, and processors' selection of supply channels (Green and Rao, 1971; Benedict and Steenkamp, 1987; Forsen et. al., 1997; Hobbs, 1996a). These researchers use a multivariate utility structure in their work and investigate the joint effects of two or more variables at the level of interval scales from rank-ordered data.

Conjoint models belong to a large class of models referred to as multi-attribute choice models. These models are based on the assumption that consumers or producers make decisions about alternative products or services on the basis of an evaluation of characteristics of those multi-attributes (Bettman, Capon and Lutz, 1975; Green and Srinivasan, 1978; Cattin and Wittink, 1982). In other words, conjoint models order the set of multi-attribute alternatives in terms of overall worth. Here, the rationality of consumers' choice is important. If consumers' behaviour is consistent and can be related to some objective criteria, it is said to be rational (June and Smith, 1987).

The conjoint models allow one to estimate the trade-off producers make when choosing among a number of alternative coordination concepts. Let us represent a coordination concept (H) which can be described as a bundle of n attributes: H = $(h_{1...}, h_n)$, and the other goods consumed is bundle B, where h_i refers to the i^{th} attribute. Assuming utility is additively separable in H and other bundle of goods B, the total utility derived from this can be written as:

$$U^* = U\,[H\,(h_i \ldots h_n),] + U'\,(B) \qquad (5.1)$$

Phlips (1983) stated that commodities in a particular consumption bundle could be described independently of the quantities in other groups. The utilities derived from a particular sub-group of commodities of a consumption bundle is independent from the utilities derived from some other sub-group of commodities of

the same consumption bundle. This implies that sub-groups of commodities have their individual sub-utility function, which together form the total utility. Deaton and Muellbauer (1980) pointed out that:

> "*... there is no reason why each sub-utility function could have one or more deeper sub-grouping within it, nor should we rule out the possibility that some groups may only contain one good*" (p. 122).

If total utility is a function of the sum of the utilities of sub-groups of commodities, then there exists a weak separability of the consumption bundle. Therefore, consumers could maximize each sub-utility function choosing different combinations of goods and services within a sub-group given a budget share for that sub-group. The direct application of these findings to equation (5.1) result in equation (5.2).

$$\text{Max: } U^* = U\,[H\,(h_i, \ldots\, h_n)] \tag{5.2}$$

If the services rendered in a particular coordination concept derived utility of $U(H^i)$ then an individual chooses the coordination concept in such a way that he maximizes utility derived from that particular coordination concept. Suppose that there exist two sets of multi-attributes alternatives (or two coordination concepts) such that:

$H^0 = (h^0_1, h^0_2, .., h^0_n)$ and $H^I = (h^I_1, h^I_2, .. h^I_n)$ then the additive model satisfies the conditions:

$$H^I \geq H^0 \text{ if and only if } U(H^I) \geq U(H^0) \tag{5.3}$$

Furthermore, the transitivity axiom in utility theory implies that:

$$\text{If } U(H^I) > U(H^0) \text{ and } U(H^2) > U(H^I), \text{ then} \tag{5.4}$$
$$U(H^2) > U(H^0).$$

Therefore, the producer is assumed to choose a particular supply channel that gives him a maximum utility. This result allows one to use utility maximizing behaviour in choosing a particular coordination concept. Using the additive composition rule, the utility derived from a particular coordination concept could be represented as:

$$U = \alpha_i h_1 + \alpha_j h_2 + \ldots + \alpha_n h_n \tag{5.5}$$

where the coefficients, α_i's are marginal utilities or part-worth utilities.

5. 4 Product/Service Attributes and Attribute Levels

Attributes used in this study were related to the services rendered in each coordination concept and were used to gauge producers' attitudes towards different coordination mechanisms. As discussed above, the inclusion of a large number of attributes, as well as a large number of levels in each coordination concept, creates several problems in collecting data and in estimating the model. This study focused on the coordination of activities of cow-calf producers with respect to selling weaned calves or backgrounded/finished cattle.

There are several possible ways in which cow-calf producers could sell weaned calves or backgrounded/finished cattle depending on the level of integration in to the backgrounding or finishing functions. This variable was included in the study to measure the producers' trade-off between different levels of integration and two other transaction costs variables.

The second attribute is the nature of the transaction or choice of marketing channel. Producers may have several options to sell their cattle but for simplicity, two broad groups of these methods, (i) selling at an auction market and (ii) selling through a contractual arrangement, were the two levels considered in this study. Contractual arrangements reduce the costs involved in gathering information and searching out new buyers. Selling through direct contractual arrangements reduces the transaction costs involved with repeated search for information about buyers, and prices as opposed to that of auction or open market transactions. In other words, reducing the transaction costs involved with searching for new buyers or for better prices affects the choice of governance structure.

The third attribute was the willingness of cow-calf producers to meet product specifications. Two levels of this attribute were considered: (a) producer is willing to meet product specifications imposed by the buyers and (b) producer is not willing to meet buyers specifications. Inclusion of product specifications was designed to evaluate the readiness of cow-calf producers to meet certain specifications imposed by packers or feedlots. This may include genetics, animal health, feeding types and weight gain. Producers' willingness to meet specifications reduces the uncertainty

present in grade or quality attributes. The reduction in uncertainty in turn affects the organizational structure of the industry (Williamson, 1986). A product with clearly defined attributes is more likely to be traded at an auction market whereas a product whose attributes are less certain is more likely to be traded through direct contractual arrangements or an alliance. This concept gives some insight into the producer's attitude towards emerging coordination mechanisms or grading schemes.

The model used in this study is therefore:

Total worth of a coordination profile = Part-worth of $level_i$ for attribute1 +
Part-worth of $level_j$ for attribute 2 + ...+
Part-worth of $level_k$ for attribute n

where a particular supply channel includes n attributes and subscript i, j and k represent the levels in each attribute.

The statistical model is therefore,

$$P = \alpha_0 + \alpha_1 T_1 + \alpha_2 T_2 + \alpha_3 N + \alpha_4 M + \varepsilon \qquad (5.6)$$

Where P = Respondents' 1 –11 ratings

α_0 = Constant

T = Type of cattle sold. T_1 = 1 if he sells weaned calves, 0 otherwise
T_2 = 1 if he sells backgrounded cattle,
0 otherwise

N = Nature of transaction. N = 0 if sells at auction, 1 if he sells directly.

M = Product specification. M = 0 if he is willing to meet specification and 1 if he is not willing to meet specification, and

ε = Error term, which is assumed to be $\sim N(0, \sigma^2_\varepsilon)$.

Table 5.1 below shows the different levels of each attribute.

The next step of the conjoint analysis was to develop coordination profiles, which describe hypothetical coordination scenarios as different combination of the three attribute levels. The full factorial produces 12 possible coordination concepts (3x2x2). As discussed above, the twelve scenarios produced from the full factorial design is somewhat impractical to use in the survey because respondents would

Table 5.1 Service Attributes and Its Levels

Service attribute	Attribute level
Types of cattle sold	Weaned calves Backgrounded cattle Finished cattle
Nature of transaction	Auction market Direct-to-backgrounder/packer sales
Product specification	Willing to meet buyers specifications Not willing to meet buyers specifications

be confused in evaluating all these scenarios accurately. Therefore, the number of coordination profiles was reduced using the orthogonal plan of the SPSS Conjoint Procedure (SPSS Inc., 1997). The orthogonal plan produces the minimum number of coordination profiles required to measure the main effect of each activity ignoring the possible interaction effects. The orthogonal plan involved with these three attributes produced eight scenarios (Table 5.2). For example, the case one scenario is

Table 5.2 Alternative Coordination Concepts

Case	Type of cattle	Willing to meet buyer specifications	Nature of transaction
1	Weaned	Yes	Auction
2	Weaned	No	Direct
3	Backgrounded	Yes	Auction
4	Weaned	No	Auction
5	Finished	No	Auction
6	Weaned	No	Direct
7	Finished	Yes	Direct
8	Backgrounded	No	Direct
9	Finished*	Yes	Direct
10	Backgrounded*	No	Auction

* Hold-out scenario

"selling weaned calves at auction market, meeting product requirements specified by the buyer". Two additional scenarios called 'hold out scenarios' were also included in the survey to measure the predictive ability of the estimated model.

Producers were asked to rate different coordination profiles according to their preferences. When rating the given profiles, producers value the whole coordination profile giving due consideration to each part worth. This is one of features that makes conjoint analysis more realistic. The part worth indicates the relative importance of each attribute in terms of its contribution to the overall preference of a coordination profile.

5. 5 Data Collection and Tabulation

This study was carried out in the province of Saskatchewan. If a sample could have been drawn from all cow-calf producers in Saskatchewan it would give the study unbiased results. Since there is no complete list of cow-calf producers this was not possible. Instead the questionnaire was sent to 810 beef cattle producers who are members of the Saskatchewan Stock Growers Association (SSGA). To the extent that SSGA members are not representative of all cow-calf producers introduces this some potential bias. There are indications that membership comes largely from southern Saskatchewan and may represent the more independent minded producers.

The mailing list for these producers was obtained from the SSGA. Surveys were mailed on March 20, 1999. Respondents were asked to return the questionnaires by April 20, 1999. For each mailed questionnaire, an introductory letter explained the purpose and importance of the study (Appendix B). To encourage a good response rate, six prizes were offered each worth $50. Completed questionnaires were returned in an enclosed stamped self-addressed envelope. Of the total of 810 mailed out surveys, 256 (32 percent) were returned. Of these only 185 surveys were usable for the study. The remaining 71 surveys were either incomplete or returned blank because of foreclosure of beef enterprises or unwillingness to

participate in the study. Collected data were then tabulated in the SPSS version 9.0 database.

5. 6 Data Analysis

Tabular, graphs and statistical analyses were employed where necessary to analyze collected data. Tabular analysis and graphs (pie charts, line and bar charts) were used to describe the current production and marketing arrangements. The results are presented in chapter 6. The answers to questions 1 and 2 provided the information on current production of beef cattle in Saskatchewan and pie charts and bar charts were used to present this information. The importance of the beef cattle enterprise to net family income was gauged from the answers to question 3 and a bar chart was used to present them graphically. Beef cattle producers experience in cattle operations were provided from the answers to question 4 and summary results were presented in tabular form. Question 5 is related to the method of buying weaned calves for backgrounding and bar charts and simple tabular analyses were used to present this information. Part B of question 5 involved measuring the satisfaction the respondents derived from a particular marketing channel. The significant departure of the average levels of satisfaction from the mid-point of the scale was measured using a 't' statistic. In question 6, respondents were asked to state the modifications made, if any, to their beef enterprise over the last three years. Correlation analysis was performed for these variables to examine possible relationships.

The responses provided to question 7 were analyzed both graphically (bar charts) and statistically ('t' test). The 't' statistic was used to measure the significant departure of agreement for the statements given in this question from the mid point of the scale. In addition, linear regression and cross-tabulation analyses were performed to investigate what factors significantly influence the vertical and horizontal coordination of the Saskatchewan beef industry.

Questions 8, 9 and 10 provided the information about the selling of weaned calves or backgrounded cattle or finished cattle. The same procedure used in

question 5 was used for these three questions in measuring the significant departure of average satisfaction levels from the mid point of the scale.

The responses to questions 11 were used to identify factors affecting declining beef consumption in North America and simple tabular analysis was used to present the results. Beef cattle producers' attitudes towards the effect of declining per capita beef consumption on the future of the Saskatchewan's beef industry was measured by the information provided to question 12. The optimistic nature of beef cattle producers about the Saskatchewan beef industry were analyzed through the use of 't' tests and presented in tabular form. The 't' test was used for the collected data in question 14 to examine the respondents' evaluations of options for improvement of the beef industry. Question 15 was used to measure the producers' opinion about the future direction of the beef industry. Again a simple table was used to present producers' responses. Question 16 was designed to measure producers' attitudes about the changes, which they felt were needed in different sectors of the beef industry. Questions 17 and 18 involved measuring producers' attitudes about drawbacks and benefits attached to the program of Marketlink and MSA, respectively. Again, the significant departure of the average score from mid point of the scale was measured using 't' statistics and results were presented in tabular form.

The responses given to question 19 were analyzed using the Conjoint Procedure of the SPSS statistical package. The SPSS Conjoint Procedure estimates a conjoint model using ordinary least squares and it treats each attribute as a dummy variable. In estimating the model, the conjoint procedure excluded the two-holdout scenarios from the analysis and kept them only to check the validity of the estimated model. Individual part worths were estimated first for each respondent and then these individuals part worths were averaged across the respondents to give results for the entire sample. An estimation of the model for each individual is possible because the number of observation (10) obtained from an individual exceeds the number of independent variables (4) in the model.

The part-worth values are then used to calculate the relative or averaged importance of attributes (RI). The following formula is used for this purpose (Hair et al., 1992).

$$RI_i = [(Range_i) / (\text{Sum of ranges})] * 100,$$

where $Range_i$ is the part-worth value of the most preferred level of the attribute i minus the part-worth value of the least preferred level of the attribute i.

The attribute with the widest range of part-worth estimates is the most important attribute (Hair, et al., 1992). The attribute ranges are standardized by dividing each range by the sum of all the ranges, so that the averaged importance values of attributes sum to one. The results of the survey and analyses are presented in chapter 6.

CHAPTER 6

RESULTS AND DISCUSSION

6.1 Introduction

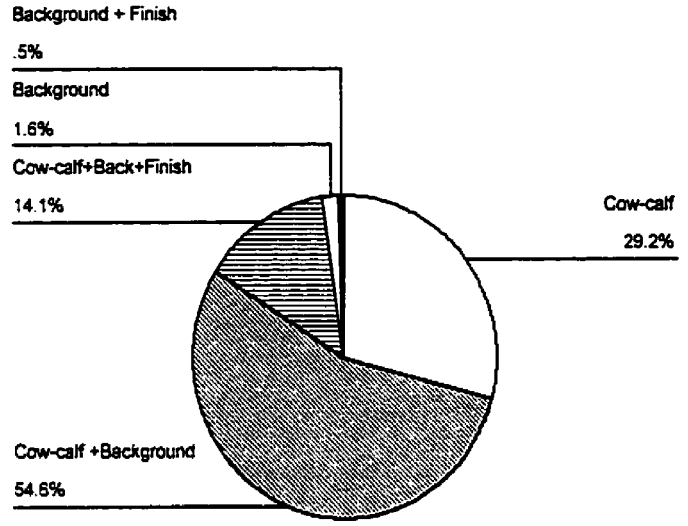
The results of the study are presented in this chapter. The chapter begins with a discussion of current production arrangements within the beef cattle industry in Saskatchewan (Section 6.2). Section 6.3 is devoted to a discussion of the current marketing arrangements. Producer attitudes towards future production and marketing arrangements are discussed in section 6.4. The summary of this chapter is presented in section 6.5.

6.2 Current Production Arrangements

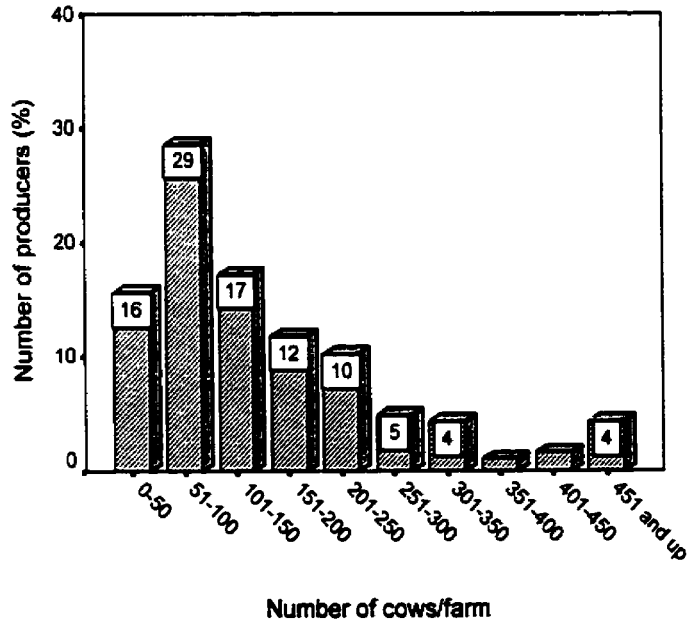
6.2.1 Nature of the Beef Operation

The survey respondents represented a range of beef enterprises from cow-calf to finishing operations. Respondents were asked to indicate their type of operation either as (i) cow-calf, (ii) cow-calf + backgrounding, (iii) cow-calf + backgrounding + finishing, (iv) backgrounding, (v) backgrounding + finishing, and (vi) finishing. The majority of the respondents (55 percent) said they had cow-calf + backgrounding operations (Figure 6.1). Approximately, 30 percent of respondents are cow-calf producers while the remainder belong to the categories of cow-calf + backgrounding + finishing (14 percent), backgrounding (1.6 percent) and backgrounding + finishing (0.5 percent).

The cowherd size ranged from 0 - 1100 head with an average of 162 cows, which is much higher than the average cowherd size of 40 in Saskatchewan (Brown, McNinch and Taylor, 1997a) (Figure 6.2). The highest number of operations (29 percent) had a herd of between 51 - 100 cows. Approximately 17 percent of respondents had a cowherd of less than 50. The majority of the operations (63 percent) were less than 150 cows.



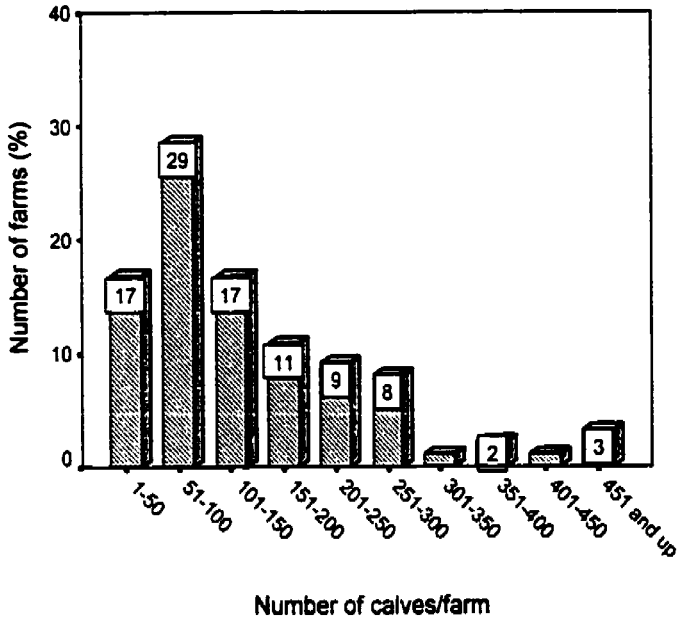
Source: Survey
Figure 6.1 Distribution of Beef Cattle Operations



Source: Survey

Figure 6.2 Size of Operation by Number of Cows

The size of beef cattle operations can also be gauged from the number of calves weaned or number of cattle backgrounded or finished to slaughter weight. The distribution of beef cattle operations in terms of number of weaned calves is shown in Figure 6.3. Cow-calf operations in the sample ranged from 1 - 1100 weaned calves with an average of 154 per farm. This distribution is similar to the distribution of the cowherd discussed above.

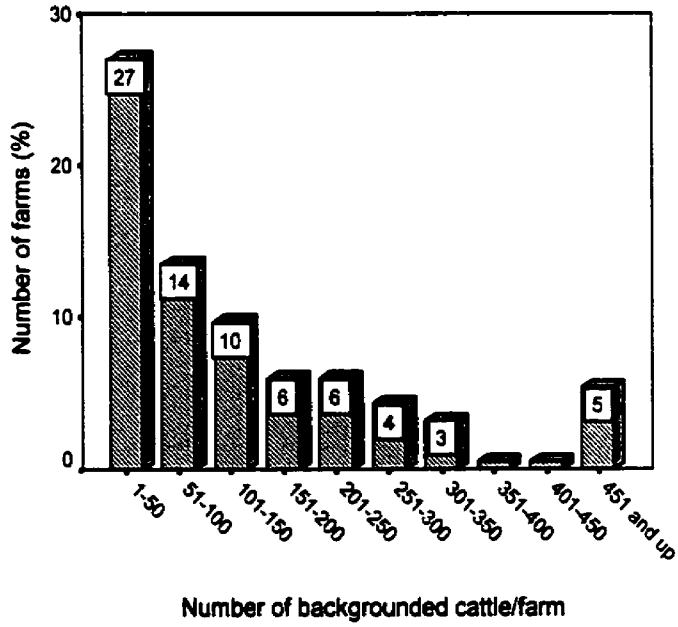


Source: Survey

Figure 6.3 Size of Beef Operation by Number of Weaned Calves

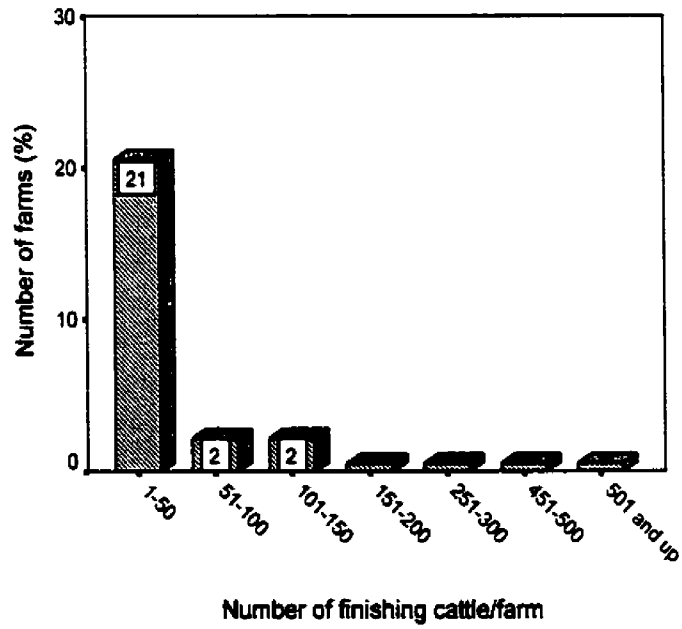
The distribution of producers based on the number of cattle backgrounded is shown in Figure 6.4. While approximately 70 percent of the operations surveyed had backgrounded calves, small-scale producers dominate the backgrounding operations with 51 percent of respondents having less than 150 head.

Beef cattle finishing on farms is not as common and is limited primarily to small-scale operations (Figure 6.5). Only about 27 percent of producers finish at least 2 – 3 of their cattle. Number of cattle finished ranged from 0 – 1,250 with an average of 18 cattle. Approximately 21 percent of producers fed cattle to slaughter weight with a herd size less than 50.



Source: Survey

Figure 6.4 Size of Beef Operation by Number of Cattle Backgrounded



Source: Survey

Figure 6.5 Size of Beef Operation by Number of Cattle Finished

In essence, the above results indicate that the Saskatchewan cow-calf sector is characterized by a large number of small producers with a herd size between 50 - 100 cows. Although most cow-calf producers' background calves in their farms, only a few producers finish their stock.

6.2.2 Nature of Cattle Breeding Practices

Beef cattle producers were asked what method they use to breed their cows. As shown in Table 6.1, the most common breeding strategy was to use owned bulls (60 percent). The number of cows bred using owned bulls ranged from 0 - 1100 with an average of 141. Artificial insemination (AI) is not widely used. Only fourteen percent of respondents said they used AI in combination with bulls where bulls are used as 'cleanup'. Similarly, another fourteen percent had cattle in community pastures where producers used their own bulls plus pasture bulls.

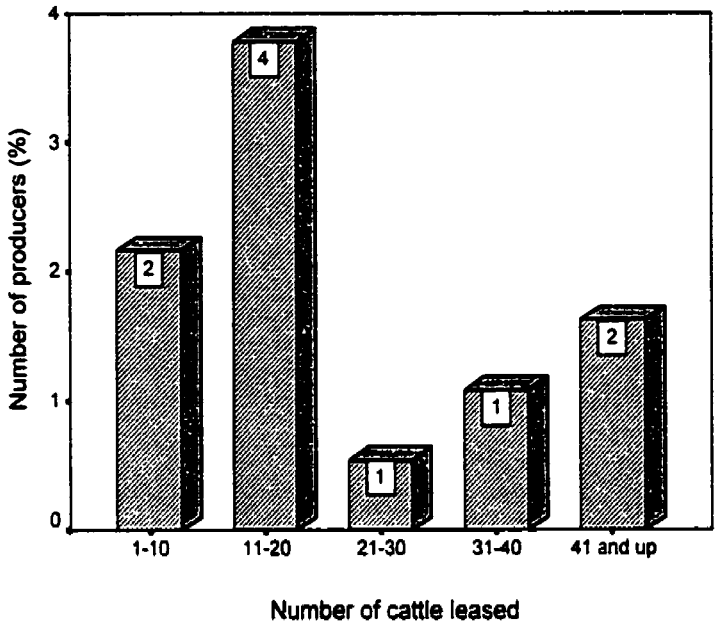
Table 6.1 Uses of Alternative Breeding Methods

Breeding Method	Number of Producers (%)
Owned bulls	60
Rented bulls	1
Community pasture bulls	2
Artificial insemination	0*
Owned + rented bulls	5
Owned + community pasture bulls	14
Owned bull + AI	14
Rented + community pasture bulls	0*
Rented bulls + AI	0*
More than two methods above	3

*Numbers are less than 0.05
Source: Survey

6.2.3 Cattle Leasing

Only about ten percent of producers in the sample reported leasing cattle in 1998 (Figure 6.6). Number of cattle leased ranged from 1 - 118 with an average of three. Only a few producers (4 percent) leased more than 20 cattle suggesting that a cattle leasing is not a popular strategy in Saskatchewan.



Source: Survey

Figure 6.6 Percentage of Producers Leasing Cattle in 1998

6.2.4 Breed Specialization

Approximately 47 percent of surveyed operations specialized in a particular breed (Table 6.2). Those who did specialize focused on one to ten individual breeds. The most common breed was Hereford (16.2 percent) followed by Black Angus (11.4 percent). Approximately 13 percent of respondents focused on two breeds while seven percent specialized in cross breeds. However, 33 percent of those surveyed do not specialize in any breed.

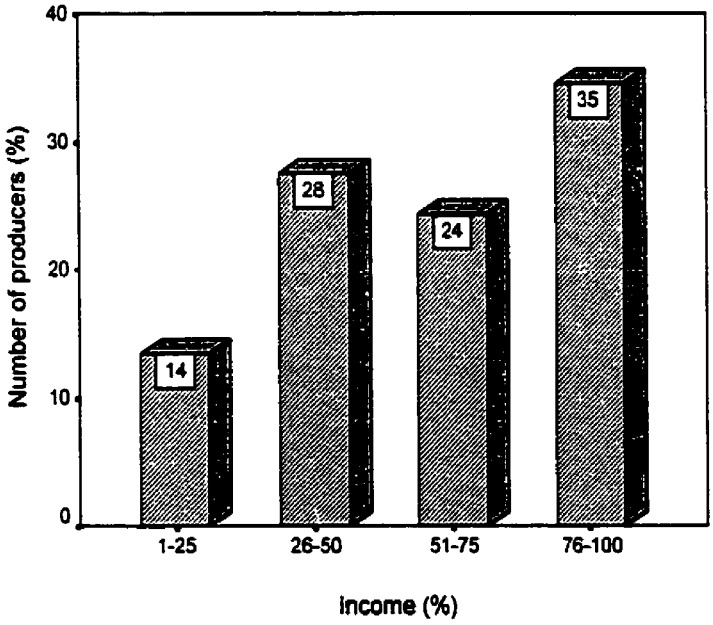
6.2.5 Beef Cattle Enterprise Net Income

Question four of the survey was designed to gauge the importance of the beef cattle enterprise to household net income. This ranged from eight percent to 100 percent with an average of 63 percent. Approximately 60 percent of respondents received more than 50 percent of family net income from their beef cattle enterprise (Figure 6.7). These results reveal the importance of the beef cattle enterprise for household income and therefore for policy makers focusing on the beef industry.

Table 6.2 Breed Specialization

Breeds	No. of Producers	Percentage	Cumulative %
Specialized in one breed:			
Hereford	30	16.2	16.2
Black Angus	21	11.4	27.6
Charolais	8	4.3	31.9
Red Angus	7	4.0	35.9
Shorthorn	8	4.3	40.2
Simmental	6	3.2	43.4
Limousin	3	1.6	45.0
Beef Booster	2	1.1	46.1
Excelerator	1	0.5	46.6
Gelbrich	1	0.5	47.1
Two breeds	24	12.9	60.0
Crosses	13	7.0	67.0
Not specializing	61	33.0	100.0
Total	185	100.0	

Source: Survey



Source: survey

Figure 6.7 Percentage of Family Net Income Earned from the Beef Cattle Enterprise

6.2.6 Operators' Experience with Beef Cattle Enterprises

The distribution of respondents according to the number of years they have been involved in beef cattle farming is shown in Table 6.3. Approximately 25

Table 6.3 Experience in Beef Cattle Farming

Years	No. of Producers	Percentage	Cumulative %
1 – 10	13	7.0	7.0
11 – 20	33	17.8	24.8
21 – 30	71	38.4	63.2
31 – 40	39	21.1	84.3
41 – 50	15	8.1	92.4
51 – 60	9	4.9	97.3
61 – 70	3	1.6	98.9
71 and up	2	1.1	100.0

Source: Survey

percent of respondents have 20 or less years of experience in beef cattle operations. These respondents can be further categorized as having experience of less than 10 years (7 percent) and 11 - 20 years (17.8 percent). Approximately 38 percent have been involved in beef cattle farming for 21 - 30 years and 21 percent for 31 - 40 years. These two categories represent about 60 percent of the respondents. Approximately 16 percent of producers have experience in beef cattle farming for more than 40 years. On average, producers have about 30 years of experience in beef cattle farming.

6.2.7 Changes in the Beef Cattle Operations

Respondents were asked what changes they have made to their beef operation over the last three years. The most common reported change was increased herd size (54 percent) followed by improved breeding stock (51 percent), conversion of grain land to pasture land (43 percent) and improved feed quality (39 percent) (Table 6.4). These results are closely comparable to the results obtained by Spriggs and Hobbs (1998). Spriggs and Hobbs conducted a study of beef cattle producer attitudes towards quality assurance and other beef industry issues in Alberta and Ontario and found that improved feed quality was the major change carried out by 44 percent of respondents.

Table 6.4 Changes Made to Beef Operations over the Last Three Years

Changes Made	Number of Respondents	Percentage	Rank
Improved feed quality	72	38.9	4
Improved veterinary care	46	24.9	6
Maintain records for each animal	42	22.2	7
Supplementary feed	50	27.0	5
Improved breeding stock	95	51.4	2
Started a joint venture	14	7.6	9
Entered into contracts	12	6.5	10
Convert grain land to pasture land	80	43.2	3
Increased herd size	100	54.1	1
Decreased herd size	29	15.7	8

Source: Survey

Note: Because the respondent has made more than one change, percentages do not add up to 100.

The first place ranking of increased herd size as the main change can be attributed to the potential availability of resources in the province to produce more beef cattle. In addition, Leung et. al.,(1991) reported for cow-calf operations, the benefits from economies of size existed up to a herd size of 868 feeder calves marketed.

The second most important change was improved breeding stock (51 percent). The use of improved breeding stock may represent an attempt by producers to respond to consumers' demand for higher quality beef or increased global competition for quality beef. Conversion of grain land to pastureland (43 percent) may reflect a long run response to removal of the Western Grain Transportation Act (WGTA). With removal of the WGTA in 1995, producers may find that production of grain is not economical for at least some part of their land, therefore, providing an incentive to convert to pastureland.

Increased herd size may be positively related to the conversion of grain land to pastureland, improved veterinary care, improved breeds, entering into contractual arrangements or joint ventures and improved feed. This hypothesis was tested using correlation analysis and the results are summarized in Table 6.5.

Table 6.5 Correlation Analysis of Changes Made to Beef Enterprise

	Herd size	Convert grain land	Contract	Joint ventures	Improved breeds	Veterinary care	Improved feed
Herd size	1						
Convert grain land	0.214**	1					
Contract	0.11	0.36	1				
Joint ventures	0.05	-0.04	0.17*	1			
Improved breeds	0.231*	0.04	0.00	0.07	1		
Veterinary care	0.10	0.02	0.255*	0.21**	0.266*	1	
Improved feed	0.145*	0.77	0.147*	0.062	0.299*	0.406**	1

* Correlation significant at the 0.05 level
** Correlation significant at the 0.01 level
Source: Survey

As shown in Table 6.5, increased herd size is positively and significantly correlated with conversion of grain land into pastureland, use of improved breeds, and improved feed. The policy implications of these results could be interpreted as any policy change, such as the removal of the WGTA and the Craw Benefit Grain Rail Freight Subsidy, which decreases the profit margin of grain farming would give an incentive to increased livestock production (i.e. beef cattle). Availability of improved genetic (breeds) or feed may also have significant positive impacts on the increased size of the cattle herd. The next most important changes reported were the use of supplementary feed (27 percent), improved veterinary care (25 percent) and maintaining records for individual animal (22 percent) (Table 6.4). Joint ventures and entering into contractual arrangements are ranked very low, suggesting that contractual arrangements are not yet important. However, it may start to emerge as one of the important coordination mechanisms in Saskatchewan's beef industry.

6.3 Current Marketing Arrangements

Beef cattle producers' attitudes towards alternative marketing arrangements were analyzed based on the buying and selling of weaned calves, and selling backgrounded feeders and finished cattle. The following four sections discuss these activities separately.

6.3.1 Buying Weaned Calves

Buying weaned calves for backgrounding was a practice of 45 respondents (24 percent). They bought weaned calves in 1998 through various marketing arrangements including auction markets, contractual arrangements, order buyers (who buy cattle from producers on behalf of feedlot operators or for packers) and some other methods such as buying directly from Heartland Livestock.

The auction market was the most common marketing arrangement for buying weaned calves. Of those who bought weaned calves in 1998, approximately 58 percent of respondents bought weaned calves from auction markets in 1998. The number of weaned calves purchased by this arrangement ranged from 3 – 2,700 per farm with an average of 356 calves (Table 6.6).

Table 6.6 Buying Weaned Calves by Marketing Arrangement

Marketing arrangement	No. of buyers %	Average no. calves bought	Average level of satisfaction	't' value	Probability
Auction	58	356	3.86 (0.97)	4.69	0.000
Direct purchase through:					
Written contract	2	100	4.00	-	
Verbal arrangements	16	43	4.13 (1.36)	2.34	0.051
Order buyer	20	194	3.83 (0.39)	7.42	0.000
Other methods	4	85	4.50 (0.71)	3.00	0.205

Source: Survey
Note: Numbers in parentheses are standard deviations

The second and third most important marketing arrangements were buying weaned calves through an order buyer (20 percent) and with verbal arrangements (16

percent), respectively. The number of calves bought through order buyers (6 percent) ranged from 9 – 1,050 calves with an average of 194 per farm.

The choice of marketing channel depends on many factors such as time and cost incurred in finding sellers, assurance of quality, and urgency of subsequent operations. In this respect, producers were asked to indicate the level of satisfaction they derived from a particular marketing channel for buying weaned calves on a 5-point scale, where 1 is very unsatisfactory, 3 is indifferent and 5 is very satisfactory. The number of buyers, average level of satisfaction, 't' statistics, and the probability of the 't' values are summarized in Table 6.6. The probabilities for 't' values give an indication of whether the average level of satisfaction is significantly different from the indifferent point of three. For example, if the probability value for a particular marketing channel is less than 0.05 but greater than 0.01, the departure of the average level of satisfaction from the indifferent point is significant at the 0.05 level.

The respondents who bought weaned calves from an auction market returned an average score of 3.86, which lies between indifferent (3) and the satisfactory point (4) of the scale. The departure of this average score from 3 is highly significant suggesting that producers are somewhat satisfied with the auction market arrangements.

Those respondents reporting buying weaned calves from an order buyer had an average score of 3.83. The 't' value was highly significant suggesting that producers are somewhat satisfied with these marketing arrangements. Approximately eight producers used direct purchase marketing arrangements in 1998 returning an average level of satisfaction of 4.13. However, the 't' value was not significant at the 0.05 level but it is very close to the critical point. The two respondents (4 percent) who reported buying weaned calves through other methods had an average level of satisfaction of 4.5. However, the small number of respondents in this category means that we cannot draw any firm conclusions from these results.

In summary, buying weaned calves for backgrounding is a practice of a limited number of beef cattle producers. Producers tended to use auction market and order buyer arrangements when the transaction involves large numbers of calves. Although the average level of satisfaction producers derived from these two market

alternatives were lower than the written contracts or verbal arrangements in absolute terms, the sample sizes in these marketing alternatives were not large enough to make a comparison between them.

6.3.2 Selling Weaned Calves

A majority of respondents (64 percent) reported that their calves were sold after being weaned. The marketing alternatives were the same as discussed in the preceding sections. Of the 118 producers who sold weaned calves in 1998, 86 percent of producers sold calves through auction markets (Table 6.7). The remaining

Table 6.7 Average Number of Calves Sold and the Level of Satisfaction Derived from Alternative Marketing Arrangements

Marketing arrangement	No. of sellers %	Average no. calves sold	Average level of satisfaction	't' value	Probability
Auction	86	74	3.98 (0.86)	11.45	0.000
Direct selling through:					
Written contracts	2	48	4.50 (0.71)	3.00	0.205
Verbal arrangements	4	64	4.60 (0.55)	6.53	0.003
Order buyer	11	157	3.85 (1.07)	2.86	0.014
Other methods	4	79	4.20 (0.84)	3.21	0.033

Source: Survey

Note: Numbers in parentheses are standard deviations
Percentages do not add up to 100 because some producers used more than one marketing mechanism.

respondents sold weaned calves directly to backgrounders or to feedlots through: (i) a written contract (2 percent); (ii) verbal arrangements (4 percent); (iii) an order buyer (11 percent); and (iv) to other markets (4 percent) such as satellite sale, purebred sale, Heartland Livestock.

The number of calves sold through auction markets ranged from 2 - 400 with an average of 74 calves per producer (Table 6.7). Producers who sold calves using written contracts ranged from 45 - 50 with an average of 48 calves per producer, although the sample size for this category was too small to be considered representative. Similarly, calves sold with verbal arrangements ranged from 3 - 170

with an average of 64. The number of calves sold through order buyer ranged from 2 - 800 with an average of 157. Calves sold through other methods ranged from 10 - 250 with an average of 79. These results suggest producers' preferences for auction markets and order buyers when the transaction involved somewhat large numbers of cattle.

Producers were also asked to indicate the level of satisfaction they derived from the above marketing arrangements on a scale of 1 - 5 where 1 is very unsatisfactory, 3 is indifferent and 5 is very satisfactory (Table 6.7). The computed average level of satisfaction for the auction market was 3.98, which represents a highly significant departure from the mid point of the scale.

Direct selling of calves through a verbal arrangement received an average level of satisfaction of 4.60, which is a highly significant departure from the mid point of the scale. Selling weaned calves through order buyers returned an average level of satisfaction of 3.85. This score is significant at the 0.05 level. The number of weaned calves sold through 'other methods' returned an average level of satisfaction 4.20, which is also significant at the 0.05 level. These results suggest that direct selling arrangements derived the highest level of satisfaction, however caution should be exercised in comparing these results because some marketing alternatives were used by a very few number of producers.

Producers were also asked to indicate the changes needed, if any, to improve current marketing arrangements. Of the 118 producers who sold weaned calves in 1998, only 20 percent responded. Of them, approximately eight percent reported that they were not obtaining a better price. Five producers (4 percent) raised the issue of marketing commission charges and said that marketing commissions should vary according to the changing price of cattle. Another three percent of respondents highlighted the need for more buyers in order to make the market more competitive. These producers might expect increased competition to lead to a rise in the price of calves. Of the remaining respondents, approximately two percent reported that there were too many middlemen while another three percent reported no improvements needed.

In summary, the majority of cow-calf producers sold their calves just after weaning. Although producers tended to derived somewhat higher levels of satisfaction from direct selling arrangements, the majority of producers use auction markets and order buyer arrangements.

6.3.3 Selling Backgrounded Feeders

A majority of cattle producers (62 percent) raised cattle up to the backgrounding stage and then sold them to feedlot operators. The most common market alternative for selling backgrounded feeders was at auction market (Table 6.8). Approximately 76 percent of producers sold their backgrounded feeders at

Table 6.8 Average Number of Cattle Sold and the level of Satisfaction Derived from Alternative Marketing Arrangements for Backgrounded Cattle

Marketing arrangement	No. of sellers %	Average no. cattle sold	Average level of satisfaction	't' value	Probability
Auction	76	101	3.47 (0.84)	5.31	0.000
Direct selling through:					
Written contract	2	982	4.25 (0.50)	5.00	0.015
Verbal arrangements	4	95	4.22 (0.67)	5.50	0.001
Order buyer	14	257	4.19 (0.66)	7.25	0.000
Other methods	4	256	3.88 (1.36)	1.83	0.111

Source: Survey

Note: Numbers in parentheses are standard deviations

Percentages do not add up to 100 because some producers used more than one marketing alternatives.

an auction in 1998. The number of feeders sold at auction ranged from 5 - 1000 with an average of 101 per producer. The second most important market alternative was selling through an order buyer. About 14 percent of producers sold their feeders through order buyers and the number of feeders sold ranged from 71 - 750 with an average of 256. The third most common marketing alternative was verbal arrangements, although this only accounts for four per cent of sellers. The number of feeders sold using this alternative ranged from 10 - 350 with an average of 95. The next most important market alternative was selling feeders through other market

channels, which includes satellite sales, Heartland Livestock, through advertising and private sale. Approximately, four per cent of producers used this alternative market arrangement and the number of feeders sold ranged from 17 - 1000 with an average of 256. Use of written contracts was very minimal and only four percent used this method. The number of cattle sold through this method ranged from 27 - 2700 with an average of 982, which is extremely high compared to other alternatives.

The following results are presented with the caveat that the sample sizes for the categories "written contracts", "verbal arrangements", and "other methods" are extremely small. Producers were also asked to indicate the level of satisfaction they derived from selling feeders using the above strategies on a 5-point scale. The average scores for all the marketing alternatives discussed above were more than 3 suggesting that producers were not dissatisfied with any of these alternatives (Table 6.8). The degree of satisfaction they derived from each alternative ranged from 3 - 5. The average levels of satisfaction derived from auction markets and selling through 'other methods' discussed above lie between the indifferent and satisfactory points of the scale but the average score for 'other methods' was not significant at the 0.05 level.

The other three alternatives scored an average level of satisfaction of more than four. The 't' value for verbal arrangements and order buyers was highly significant at the 0.01 level while for written contracts it was significant at the 0.05 level. This indicates that those producers, who used written contracts and verbal arrangements, derived a comparatively higher level of satisfaction but, again, it is difficult to make a comparison between these alternative marketing arrangements because some marketing arrangements were used by a small number of producers.

As in the case of selling weaned calves, producers were asked to indicate changes needed, if any, to improve the current marketing arrangements. Of the 114 producers who sold backgrounded feeders in 1998, only 21 percent responded to this question. Of them, approximately 21 percent reported no improvements needed. The remaining producers (79 percent) suggested: (i) commission or selling charges should be based on changing cattle prices but not fixed to a particular amount; (ii) better sorting; and (iii) better pricing mechanisms.

In summary, the majority of beef cattle producers raised cattle up to the backgrounding stage and then sold them using different market alternatives. While the most common market alternative was the auction market, producers reported deriving a higher level of satisfaction from selling feeders through written contracts and verbal arrangements, but small sample sizes notwithstanding.

6.3.4 Selling Finished Cattle

Cattle finishing in conjunction with cow-calf operations are not common in Saskatchewan. Only 39 producers (21 percent) responded that their calves were retained to slaughter weight. Among these, 28 percent sold finished cattle at auction market with an average number of cattle sold of 78 (Table 6.9). Cattle selling

Table 6.9 Average Number of Finished Cattle Sold and the Level of Satisfaction Derived from Alternative Marketing Arrangements

Marketing arrangement	No. of sellers %	Average no. cattle sold	Average level of satisfaction	't' value	Probability
Auction	28	78	3.64 (1.03)	2.06	0.067
Direct selling through:					
Written contract	13	235	4.20 (0.84)	3.21	0.033
Verbal arrangements	23	56	4.11 (0.60)	5.55	0.001
Order buyer	8	174	3.88 (0.64)	3.86	0.006
Other methods	21	64	3.80 (1.03)	2.45	0.037

Source: Survey

Note: Numbers in parentheses are standard deviations

Percentages do not add up to 100 because some producers used more than one marketing alternatives

through 'other methods' (21 percent) such as telephone, private or direct selling to consumers was the next most common market alternative. Approximately, 23 percent of producers reported that they sold finished cattle through some form of verbal arrangements with an average of 56 cattle. Selling cattle through order buyers was the next most important market alternative and an average of 174 were sold. Only a few producers (13 percent) sold cattle with a written contract and on average they sold 235 cattle. The level of satisfaction derived from different market alternatives was tested using 't' statistics. Although, the average levels of

satisfaction for all the alternatives were more than the indifferent point of the scale (3), the difference for auction markets was not significant. The satisfaction derived from selling through verbal arrangements and order buyers was highly significant suggesting that some producers prefer to sell finished cattle through these arrangements.

Comparison of Alternative Selling Arrangements – Selling Finished Cattle

As shown in Table 6.9, direct selling arrangements tended to provide a higher level of satisfaction than do auction market arrangements. The mean scores were compared using 't' statistic (Table 6.10). The results show that none of them are significant at the 0.05 level.

Table 6.10 Mean Comparison of Alternative Selling Arrangements – Selling Finished Cattle

Arrangements	Differences of Means	't' value
Auction vs Written Arrangements	-0.56 (0.9276)	-1.2025^{NS}
Auction vs verbal Arrangements	-0.47 (0.7493)	-1.2079^{NS}
Auction vs Order buyer Arrangements	-0.24 (0.9106)	-0.4307^{NS}
Written vs verbal Arrangements	0.09 (0.5081)	0.2505^{NS}
Written vs Order buyer Arrangements	0.32 (0.6069)	0.6553^{NS}
Verbal vs Order buyer Arrangements	0.23 (0.3735)	0.6262^{NS}

Source: Survey

NS = Not significant at the 0.05 level

Note: Numbers in parentheses are standard errors

Producers were also asked to indicate changes needed, if any, to the current marketing arrangements. Among the 39 cattle finishers in the sample, only 21 percent of producers replied to this question. While the large majority (80 percent) of them did not give any reasons, only 13 percent of them reported that payment for cattle should be based on quality but not the average price. Five percent of

producers reported that the industry needs more cattle buyers while the rest (2 percent) suggested the need for futures markets.

In summary, beef cattle finishing on the farms of cow-calf operators was not common and limited primarily to small-scale operators. Producers tended to derive higher levels of satisfaction from selling finished cattle through verbal arrangements in absolute terms compared with other market alternatives, however the differences were not statistically significant at the 0.05 level.

6.4 Producer Attitudes Towards Future Production and Marketing Arrangements

6.4.1 Focus on the Consumer

(a) Is Declining Beef Consumption a Problem?

The future of the beef industry depends to a large extent on beef producers' opinions about the state of the beef industry. In the 1980s, per capita beef consumption in Canada was about 40 kg. and it has gradually declined to about 30 kg. in the 1990s (Statistics Canada, 1997). Producers were asked to indicate their opinions about the following statement.

> *"Do you think the declining beef consumption per person in North America is a problem for the future of the Saskatchewan's beef industry?"*

Approximately 81 percent of respondents felt that declining per capita beef consumption is a problem for the future development of the industry, while 14 percent felt it was not a problem. Five percent did not respond. Among those who recognized it as a problem, approximately 29 percent indicated that declining per capita beef consumption would lead to less demand for beef and beef products, while another 19 percent indicated that their income would fall (Table 6.11). Another 15.3 percent felt that they would need to depend on export markets for their product. A few respondents (1.3 percent) stated that they would be out of business, while the remaining (2 percent) indicated that there would be increased competition among producers to sell their products causing prices to decline. Approximately 33 percent of this group did not give any reasons for believing that declining beef consumption is a problem for the future of the Saskatchewan beef industry.

Table 6.11 Possible Impact of Declining Per Capita Beef Consumption on the Future of Saskatchewan's Beef Industry

Impact	No. of respondents	Percentage
Had to depend on export market	23	15.3
Producers income will be less	29	19.3
Less demand	44	29.4
Out of business	2	1.3
Increased competition	3	2.0
No response	49	32.7
Total	150	100.0

Source: Survey

Among those who felt that declining beef consumption is not a problem, approximately 31 percent indicated that they could find export markets while about 58 percent did not give any reasons (Table 6.12). The remaining 11.5 percent stated that consumers were more educated and/or will learn new cooking methods thereby causing demand for beef and beef products to increased in the near future.

Table 6.12 Suggestions to Overcome the Impact of Declining Per Capita Beef Consumption on the Future of Saskatchewan's Beef Industry

Suggestions	No. of respondents	Percentage
Export markets	8	30.8
Consumers are more educated	2	7.7
Consumers' will learn new cooking methods	1	3.8
No response	15	57.7
Total	26	100.0

Source: Survey

Producers were asked for opinions on possible causes for the decline in beef consumption in North America. The alternatives given in the questionnaire (question 11) were:

1. Rising health consciousness of consumers,
2. Price of beef is higher relative to the price of other meat,
3. Not producing the quality of beef (e.g. tenderness, juiciness) that the consumer wants,
4. Lack of ready-to-eat beef products,

5. Lack of promotion/advertising,
6. Other.

Producers were asked to rate each of the above causes on a 5-point scale, where 1 is not at all important, 3 is indifferent (or no opinion), and 5 is critically important. Only a few respondents (6 percent) gave an opinion under the category of 'other'. The responses are outlined in Table 6.13. Producers tended to regard all

Table 6.13 Factors Affecting Declining Per Capita Beef Consumption in North America

Factors	No. of respondents	Average score	't' value	Probability
Health consciousness	185	3.30 (0.87)	4.62	0.000
Higher price of beef	185	3.29 (0.92)	4.33	0.000
Not producing the quality of beef that the consumer wants	185	3.43 (1.19)	4.93	0.000
Lack of ready-to-eat beef Product	185	3.90 (1.07)	11.45	0.000
Lack of promotion/advertising	185	3.64 (1.04)	8.31	0.000

Source: Survey
Note: Numbers in parentheses are standard deviations

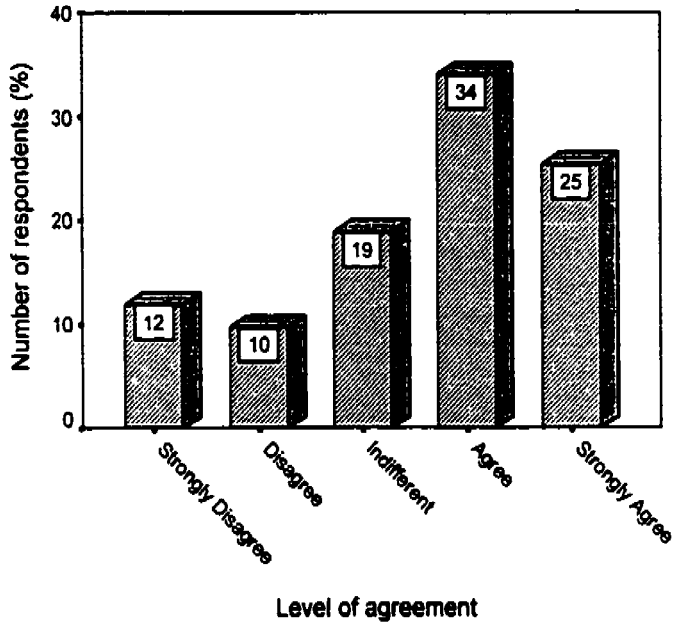
these factors as somewhat important. The average scores for all these factors fell between 3 and 4. The significant departure of average scores from mid point of the scale (3) was tested using 't' statistics. The last column of the Table 6.12 indicates the significance level of these 't' values. All the average scores were significantly different from 3 at the 0.01 level (because probabilities of all the 't' values are less than 0.01) suggesting that, in the opinion of Saskatchewan beef producers these are key factors affecting declining beef consumption. The highest priority was assigned to the lack of ready-to-eat beef products indicating indirectly the market trend of consumers' choice for more convenient ready-to-eat products rather than generic beef products. Lack of promotion/advertising was second in order of priority followed by not producing the quality of beef that the consumer wants, rising health consciousness and the relatively higher price of beef.

(b) Is Consistency of Product Quality a Problem?

In an attempt to understand producers' attitudes towards inconsistency of quality of beef products, they were asked to rate the following statement on a 5-point scale where 1 is strongly disagree, 3 is indifferent and 5 is strongly agree.

> *"The quality of higher-priced cuts of beef is inconsistent and the North American consumer has no guarantee of eating quality".*

A majority of respondents (59 percent) either agreed or strongly agreed with this statement while 19 percent of respondents were indifferent (Figure 6.8).



Source: Survey
Figure 6.8 Producers Opinion about Consumer Uncertainty of Eating Quality

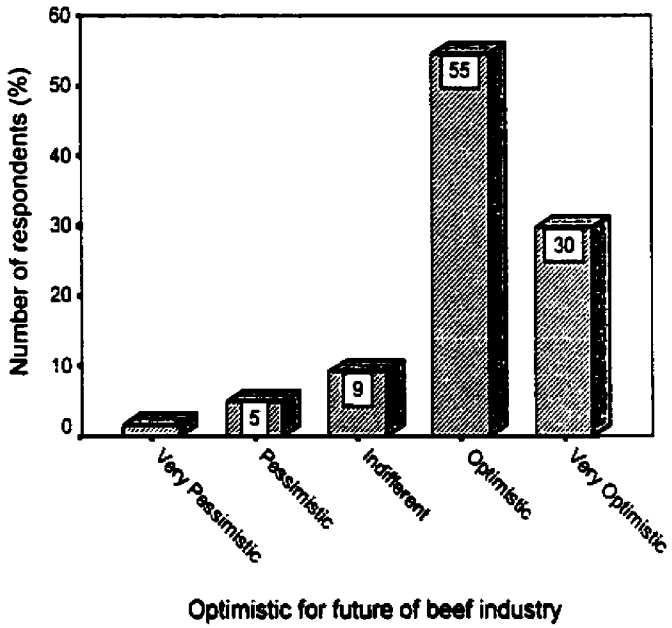
Only 22 percent of respondents either strongly disagreed or disagreed with this statement. However, on average, producers returned an average score of 3.51, which is a highly significant departure from the mid point of the scale (indifferent) at the 0.01 level. This signals the need for the development of policies aimed at increasing the consistency of beef quality and indicates a relatively strong recognition among producers of the importance of these initiatives.

6.4.2 Focus on the Future of the Saskatchewan Beef Industry

(a) Are You Optimistic?

To gauge the beef producers' attitude about the future of the Saskatchewan beef industry, respondents were asked to rate the following statement on a 5-point scale where 1 is very pessimistic, 3 is indifferent and 5 is very optimistic.

"How optimistic are you about the future of Saskatchewan's beef industry". Interestingly, 85 percent of producers were either optimistic or very optimistic about the future of the Saskatchewan beef industry (Figure 6.9). Only nine percent of



Source: Survey

Figure 6.9 How Optimistic are You About the Future of the Saskatchewan's Beef Industry

respondents were indifferent while six percent of the respondents were either pessimistic or very pessimistic. On average, respondents returned an average score of 4.06, which lies between the optimistic and very optimistic points of the scale and it was a highly significant (at the 0.01 level) departure from the indifferent point (3). These results reveal that beef producers have confidence in beef industry, which is a good sign for further improvements and development of the beef industry.

(b) What Improvements are Needed?

(i) By Function

Question 14 in the survey was designed to elicit producers' opinion about important areas for the improvement of the Saskatchewan beef industry. Producers were asked to rate the followings key areas of development on a 5-point scale where 1 is not at all important, 3 is indifferent and 5 is critically important.

1. Individual carcass-based pricing
2. Traceability of animal to the farm of origin
3. Change in grading and/or marketing system to better reflect eating quality
4. Incorporation of quality assurance scheme in production and processing
5. Development of ready-to-eat beef product
6. Increased expenditure by industry for beef production.

The respondents returned highly significant average scores for all these areas implying that producers felt that Saskatchewan's beef industry needs to focus on these areas for better development of the industry (Table 6.14). The highest priority was assigned to the development of a consumer-ready-product, returning an average score of 4.24. Incorporation of a quality assurance scheme in production and processing was ranked second followed by a change in grading and/or marketing system to better reflect eating quality and traceability of animal to the farm of origin. Individual carcass-based pricing and increased expenditure by the industry for beef production were ranked at fifth and sixth place suggesting perceived relative minor importance. Approximately eight percent of respondents indicated that advertising and programs to educate consumers were important areas to be considered but they were not as significant as the other areas.

In summary, beef producers felt that many factors were responsible for declining beef consumption in North America but the lack of understanding of consumer preference was a key problem. Producers have a good understanding about the importance of the inconsistency of beef quality. They agree with the need to develop value-based pricing schemes, the ability to trace the animal to the farm of

Table 6.14 Perceived Importance of Production and Management Practices for Improvement of the Saskatchewan Beef Industry

Improvements Needed	No. of Respondents	Average Score	't' Value	Probability
1. Individual carcass-based pricing	185	3.45 (0.97)	6.39	0.000
2. Traceability of animal to the farm of origin	185	3.52 (1.21)	5.91	0.000
3. Change in grading/marketing system to better reflect eating quality	185	3.82 (0.93)	11.92	0.000
4. Incorporation of quality assurance scheme in production and processing	185	3.90 (0.83)	14.82	0.000
5. Development of ready-to-eat beef product	185	4.24 (0.88)	19.18	0.000
6. Increased expenditure by industry for beef production	185	3.37 (1.05)	4.78	0.000
7. Advertising	10	4.00 (1.25)	2.53	0.032
8. Educate consumer	5	4.20 (1.79)	1.50	0.208

Source: Survey
Note: Numbers in parentheses are standard deviations

origin, a change in the grading and/or marketing system to better reflect eating quality and the need to incorporate a quality assurance scheme for the production or processing system. Combining these results, together with the confidence that the producers have about the future of the beef industry, there would seem to be a basis of producer support for strategies to improve the beef industry.

(ii) By Sector

Producers were asked to identify the changes that they felt were needed to make the Saskatchewan beef industry globally competitive. The greatest number of respondents (64 percent) identified the need for improved linkages between the various sectors as the most important change needed to improve the industry (Table 6.15).

Table 6.15 Sectors/Activities Needing Changes to Improve the Saskatchewan Beef Industry

Sectors / Activities	No. of respondents	Percentage
Cow-calf	76	41
Backgrounding	55	30
Feedlot	56	30
Packing / Further processing	79	43
Distribution	19	10
Wholesale / Retail	39	21
Linkages	118	64

Source: Survey
Note: Percentages do not add up to 100 because some respondents gave more than one change.

As indicated by the respondents, the changes needed in other sectors were packing/further processing (43 percent), cow-calf (41 percent), feedlot (30 percent), wholesale/retail (21 percent), and distribution (10 percent).

With respect to linkages, respondents provided a number of suggestions about which sectors needed better linkages. Of the 118 respondents, approximately 45 percent identified the need for linkages between all sectors of the beef production continuum (Table 6.16). Twenty five percent of respondents indicated cow-calf,

Table 6.16 Producers Attitudes about Linkages Needed Sectors

Sectors	No. of respondents	Percentage
All sectors	54	45
Cow-calf + backgrounding + feedlots	29	25
Cow-calf + backgrounding	25	21
Feedlot + packing	5	4
Background + feedlots + packing	3	3
Background + feedlots	2	2
Total	118	100

Source: Survey

backgrounding and feedlot sectors as the critical sectors to improve linkages. A further 21 percent reported that better linkages between the cow-calf and backgrounding sectors were needed.

The packing and further processing sectors received secondary ranking for changes needed. This ranking was consistent with the results discussed in section 6.4

in which producers gave the highest priority to the development of ready-to-eat beef products. Approximately 17 percent of producers reported the need for more packing and processing plants, while another four percent identified a need for better pricing mechanisms for their cattle. The remaining respondents provided a wide range of ideas such as information feed back and development of branded beef products.

The cow-calf-producing sector was the third most important sector where producers felt improvement was needed. Approximately 41 percent of respondents indicated that the cow-calf sector needs improvements (Table 6.15). Among the alternatives that were suggested, a need for better breeds, a reduction in the cost of production and good management practices were the most important choices. These results reveal that producers are becoming more receptive towards the concept of producing a higher quality product that can be globally competitive.

Approximately 30 percent of respondents reported that the feedlot sector needs some improvements (Table 6.15). Twelve percent of these respondents identified the need for more feedlots in order to retain feeder cattle in the province. Quality assurance and reduction of cost of production were the other suggestions made by about four percent of respondents. Approximately eleven percent of respondents did not provide any suggestions although they did identified the need for improvements in the feedlot sector. The remaining respondents suggested the need for programs like trace back and the development of good infrastructure as important areas to be developed.

Approximately 30 percent of respondents reported that backgrounding operations need changes (Table 6.15). The changes suggested included the establishment of more backgrounding operations, good management practices and lowering the cost of production. Approximately 13 percent of respondents provided no suggestions although they agreed that the backgrounding sector needs some changes. A few respondents stated that increased government involvement in roles such as the reduction of taxes and compensation for bad years were necessary.

The next common area identified was the wholesale and retailing sector, which was indicated by 21 percent of respondents (Table 6.15). The improvements

suggested included better pricing and quality assurance (seven percent), advertising (two percent), expansion of markets (two percent) and programs to educate consumers (two percent). Again, approximately seven percent of respondents gave no suggestions, although they felt there was a need for changes in this sector.

(b) How Important is Increased Coordination of the Industry?

(i) Beef Cattle Producers' Perception about the Need for Greater Cooperation

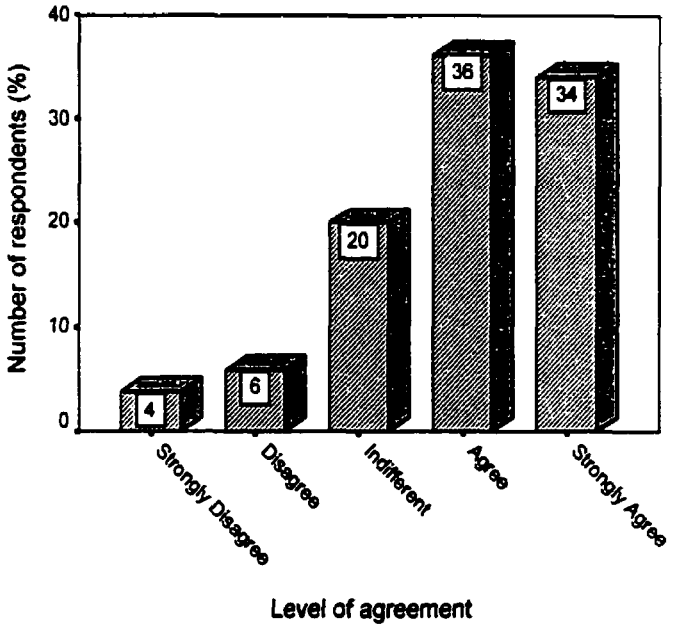
Beef cattle producers' responsiveness to new ideas or relationships with other participants in the industry depends on their perceptions of the current state of the industry. There are many ways in which cow-calf producers can cooperate. This study chose the word "cooperation" to encompass all the ways in which cow-calf producers can work together with other cow-calf producers (horizontal cooperation) and backgrounders, feedlots and processors (vertical cooperation). One alternative to cooperation is competition. What is implied by cooperation is forms of coordination.

Respondents were asked to rate to what extent they agree or disagree with the following two statements about the beef industry on a 5-point scale where 1 = strongly disagree, ..,5= strongly agree and the mid point 3 is neither disagree nor agree.

1. *"Increased cooperation among cow-calf producers is essential for the future prosperity of the Saskatchewan beef industry".*

2. *"Increased cooperation between buyers and sellers is essential for the future prosperity of the Saskatchewan beef industry".*

The first statement is an attempt to measure producers' attitudes towards the needs for increased cooperation among cow-calf producers. Responses to this question are provided in Figure 6.10. Only 10 percent of respondents disagreed with this statement while another 20 percent neither disagreed nor agreed. The remaining 70 percent, which comprised 130 producers, agreed with statement one. Of these 49 percent (or 34 percent of the total sample) strongly agreed that producers should cooperate in an attempt to develop the Saskatchewan beef industry. The average score, 't' value and the level of significance of 't' value are shown in Table 6.17.



Source: Survey
Figure 6.10 Attitudes Toward the Need for Increased Cooperation Among Cow-calf Producers

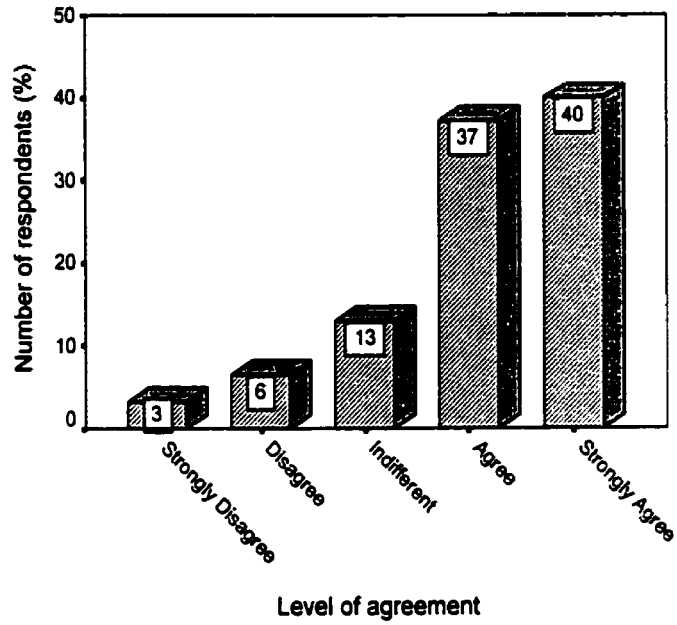
Table 6.17 Producers Attitudes Toward Different Coordination Methods

Method of coordination	No. of respondents	Average score	't' value	Probability
Horizontal cooperation[a]	185	3.91	11.69	0.000
Vertical cooperation[b]	185	4.04	13.62	0.000

Source: Survey
a = Increased cooperation among cow-calf producers
b = Increased cooperation between buyers and sellers

The average score of 3.9 is highly significant (probability of 't' value < 0.01) at the 0.01 level. This suggests that Saskatchewan beef producers on average strongly recognize the need for increased cooperation among cow-calf producers for the future prosperity of the beef industry.

The second statement was intended to measure the cow-calf producers' attitude towards increased cooperation with backgrounders and feedlots. The responses to this question are presented in Figure 6.11. A large majority of



Source: Survey

Figure 6.11 Attitudes Toward the Need for Increased Cooperation Between Buyers and Sellers in the Beef Industry

producers (77 percent) agreed with the second statement regarding the need for increased cooperation between sectors. This is about seven percent higher compared to the corresponding responses to the first statement for increased horizontal coordination. About 40 percent of respondents strongly agreed with statement two, while 37 percent just agreed. Only nine percent disagreed with this statement, which is similar to corresponding responses to statement one. The average score for statement two was 4.04, which corresponds to the "agreed" category on the rating scale. However, the average scores for both statements are highly significant at the 0.01 level but the slightly higher average score for the second statement suggests that producers tended to give slightly more value to the need for increased cooperation between different sectors of the beef industry.

Taking these results together implies that Saskatchewan beef producers wish to have closer links between buyers and sellers (vertical coordination) as well as among cow-calf producers (horizontal coordination). The recognition of the need for increased vertical and horizontal coordination is encouraging for the development of successful "farm to plate" partnerships in Saskatchewan. These results are very consistent to those of Spriggs and Hobbs (1998) who surveyed feedlots.

So far the discussion of producers' attitudes toward horizontal and vertical coordination was based on the aggregate data of the sample. However, it is important to identify how producers attitudes change with changes in: (i) income earned from the beef cattle enterprise, (ii) size of beef farm (i.e., number of cows), (iii) experience in beef cattle farming, and (iv) breed specialization.

Horizontal Cooperation

As discussed before, producers felt that increased cooperation, both horizontal and vertical, was necessary for the future prosperity of the Saskatchewan beef industry. It is interesting to note that the percentage of producers that do not feel the need for increased cooperation between cow-calf producers (horizontal coordination) declines with an increase in net income earned from the beef cattle enterprise (Table 6.18). For example, of those who received 1 to 25 percent of net

Table 6.18 Distribution of Respondents Based on Their Attitude Towards Horizontal Cooperation and Net Income Earned from Beef Cattle Enterprise

Income share (%)	Disagreed	Indifferent	Agreed	Total
1 – 25	7 (28)	8 (32)	10 (40)	25
26 – 50	3 (6)	11 (22)	37 (72)	51
51 – 75	2 (4)	10 (22)	33 (72)	45
76 – 100	6 (9)	8 (13)	50 (78)	64

Source: Survey
Note: Numbers in parentheses are percentages from row total

family income from the beef cattle enterprise, 28 percent felt that increased cooperation between producers is not important for the future prosperity of Saskatchewan beef industry, while of those respondents who received 76 to 100 percent of family net income from a beef enterprise, only nine percent disagreed with increased cooperation. A similar trend can be observed for those respondents in the indifferent category where the rise in income earned from beef enterprises accompanied a decline in the number of respondents being indifferent. The opposite is true for the respondents who felt the need for increased cooperation. That is, an increase in the importance of the beef cattle enterprise to net family income was accompanied by an increase in the number of respondents who agreed with the need for increased cooperation.

The percentage of producers who felt the need for increased cooperation between producers tended to increase with an increase in experience in beef cattle farming up to 40 years of experience and then drops back (Table 6.19).

Table 6.19 Distribution of Respondents based on Their Attitude Towards Horizontal Cooperation and Experience on Beef Cattle Enterprise

No of years	Disagreed	Indifferent	Agreed	Total
1-10	4 (31)	4 (31)	5 (38)	13
11 – 20	2 (6)	9 (27)	22 (67)	33
21- 30	8 (11)	15 (21)	48 (68)	71
31 – 40	4 (10)	2 (5)	33 (85)	39
41 – 50	-	4 (27)	11 (73)	15
51 – 60	-	2 (22)	7 (78)	9
61 –70	-	1 (33)	2 (66)	3
71 and up	-	-	2 (100)	2

Source: Survey
Note: Numbers in parentheses are percentages from row total

Approximately 38 percent of respondents who have experience in beef cattle farming of between 1 – 10 years felt the need for increased cooperation between

producers and this number gradually increased up to 85 with an increase in the number of years experience up to 40 years. Conversely, percentage of producers who do not consider increased cooperation between producers to be important gradually declined with an increase in the number of years of experience in beef farming.

A linear regression was carried out to further investigate the impact of: (i) income earned from beef cattle, (ii) size of the beef enterprise, (iii) number of years involved in the beef enterprise, and (iv) breed specialization on producers' attitude towards horizontal cooperation. The 'F' statistic of the Analysis of Variance (ANOVA) was highly significant but the model explained only 6.3 percent of the variability of the dependent variable (horizontal coordination) (Table 6.20). It is not

Table 6.20 Analysis of Variance Results for Horizontal Coordination

Source	Sum of Squares	df	Mean Square	F	Significance
Regression	17.122	4	4.281	4.092	0.003
Residual	188.316	180	1.046		
Total	205.438	184			

Source: Survey

Adjusted R- square 0.063

uncommon to have very low R-squared values even for models that show significant relationships. In fact highly significant 'F' statistics and the significant 't' values in Table 6.21 suggest that there is a significant relationship between the dependent variable and independent variables.

Although it is difficult to a priori specify the sign, one could argue that higher income from beef operations causes greater knowledge of and need for the potential benefits of closer coordination. The observed relationship was positive but the coefficient is not significant at the 0.05 level. However, the positive relationship observed was consistent with what we observed from Table 6.18 suggesting that producers' attitudes may be changing towards greater cooperation among producers.

Table 6.21 Estimated Coefficients and Their Significance Levels for Experience, Net Family Income, Breed Specialization Herd Size.

Dependent variable = Horizontal cooperation

Variable	Standardized Coefficients	't" value	Probability
Constant		12.597	0.000
Number of years of experience	0.203 (0.005)	2.789	0.006
Net family income	0.142 (0.003)	1.783	0.076
Breed specialization	-0.062 (0.163)	-0.858	0.392
Herd size	0.071 (0.001)	0.894	0.372

Source: Survey

Note: Numbers in parentheses are standard errors

One could expect negative relationships between breed specialization and horizontal cooperation because those who specialized on particular breeds cannot get much help from other producers in terms of meeting contacts. Although the results confirm to the expected sign, it is not statistically significant at the 0.05 level. Similarly, a negative sign for herd size could be expected because when herd size becomes large, it is more likely for those producers to act more independently. However, results do not confirm to the expected sign and also not statistically significant at the 0.05 level.

The inconsistent and insignificant results observed for some independent variables in this analysis can be attributed to the fact that this simple linear regression model is misspecified because it omits potentially important variables such as uncertainty. In addition, there may be multi-collinearity between herd size and net family income, which could also lead to inconsistent results.

Vertical Cooperation

Producers' attitudes toward increased vertical cooperation also appeared to be positively related to income earned from the beef cattle enterprise (Table 6.22). The percentage of producers who disagreed with the need for increased vertical cooperation declined with an increased importance of the beef cattle enterprise to

Table 6.22 Distribution of Respondents Based on Their Attitude Towards Vertical Cooperation and Net Income Earned from Beef Cattle Enterprise

Income share (%)	Disagreed	Indifferent	Agreed	Total
1-25	8 (32)	3 (12)	14 (56)	25
26-50	3 (6)	5 (10)	43 (84)	51
51-75	1 (2)	8 (18)	36(80)	45
76-100	6 (9)	8 (13)	50 (78)	64

Source: Survey

Note: Numbers in parentheses are percentages from row total

their net family income. For example, there were 32 percent of respondents receiving an income of 1 to 25 percent from a beef cattle enterprise who disagreed with increased vertical cooperation. This number declined to nine percent when the income share for the beef enterprise increases to 76 to 100. The opposite is true for the respondents in the "agreed" category. These results suggest that an increased in net family income from the beef operation tended to correspond with positive attitudes towards increased vertical cooperation between sectors.

An increase in the number of years of experience in beef cattle farming (up to 40 years) accompanied an increase in the number of producers willing to cooperate vertically and then drops back (Table 6.23). For example, of those who have experience in beef cattle farming of about 1 – 10 years, 62 percent feel that there is a need for greater vertical coordination between buyers and sellers, this number increases to 87 percent and then starts to decline.

Tables 6.24 and 6.25 below show the regression analysis results involving, experience in beef cattle farming, share of income from beef enterprise, breed specialization, herd size and vertical coordination, where vertical coordination is the dependent variable. Again, we might expect, a priori, positive relationships between the dependent variable and all these independent variables. Although the analysis of variance results are not statistically significant at the 0.05 level, the coefficients for number of years of experience and income are fairly close to the critical point of

Table 6.23 Distribution of Respondents based on Their Attitude Towards Vertical Coordination and Experience on Beef Cattle Enterprise

Experience	Disagreed	Indifferent	Agreed	Total
1-10	4 (30)	1 (8)	8 (62)	13
11-20	3 (9)	6 (18)	24 (73)	33
21-30	8 (11)	7 (10)	56 (79)	71
31-40	3 (8)	2 (5)	34 (87)	39
41-50	-	5 (33)	10 (67)	15
51-60	-	2 (22)	7 (78)	9
61-70	-	1 (33)	2 (67)	3
71 and up	-	-	2 (100)	2

Source: Survey

Note: Numbers in parentheses are percentages from row total

Table 6.24 Analysis of Variance Results for Vertical Coordination

Source	Sum of Squares	df	Mean square	F	Significance
Regression	8.581	4	2.145	2.021	0.093
Residual	191.073	180	1.062		
Total	199.654	184			

Source: Survey

Table 6.25 Estimated Coefficients and Their Significance Level for Experience, Net Family Income, Breed Specialization and Herd Size

Dependent variable = Vertical cooperation

Variable	Standardized coefficients	't' value	Probability
Constant		13.974	0.000
Number of years of experience	0.135	1.813	0.071
Net family income	0.145	1.785	0.076
Breed specialization	-0.065	-0.877	0.382
Herd size	0.002	0.020	0.984

Source: Survey

0.05. The positive coefficients for these two variables suggest that producers tended to support cooperation with an increase in number of years involved in beef cattle farming and a rise in the share of income earned from the beef enterprise which is consistent with a priori expectations although the absence of statistical significance precludes any firm conclusions. Producers that have been involved in beef farming for a long time may understand the necessity of cooperation for their inputs and outputs. As in the case of horizontal cooperation, the higher income from beef operations causes greater knowledge of and motivation for the potential benefits of greater vertical cooperation.

Those producers who produced large number of cattle may have contractual arrangements with buyers to reduce the risk associated with markets. As expected, herd size was positively related to an increase vertical cooperation but the coefficient was not significant at the 0.05 level. Specialized breeds can be thought of as asset specific investments and therefore, a priori, a positive relation with vertical cooperation. As in the case of horizontal cooperation, there is a negative relationship between breed specialization and vertical cooperation, which is an unexpected result. These unexpected results could also be attributed to the fact that this simple linear regression model might not capture the reality and may have ignored some important variables such as uncertainty. Again, the multi-collinearity between herd size and family net income from beef operation could be another factor that gives rise to the unexpected results.

(ii) Contractual Arrangements and Price Discovery

A potential reduction in prices for their cattle marketed has been voiced as a major concern about an increasing trend toward forming alliances and /or contractual arrangements between industry participants in the beef industry (The Western Producer, 1997). Another concern was that the lack of competition between packing and processing sectors which leads to contractual arrangements in the beef industry. For example:

> *"The lack of competition between packers in Western Canada - the only two plants are IBP Lakeside and Cargill – is forcing the feedlots into forming strategic alliances with them while feedlots in turn are trying to pressure*

producers into forming strategic alliances with them" (The Western Producer, 1997).

The following question was included in the survey to gauge Saskatchewan's beef cattle producers' attitudes toward the above described concern.

"If the use of auction markets for feeder cattle declines and is replaced by direct contracting, do you feel this will create a problem for adequate price discovery of cattle marketed?"

The large majority of respondents (73 percent) identified that direct contracting would create a problem for adequate price discovery for their cattle but most of them did not provide the reasons for their claim. Approximately 25 percent of respondents indicated that an increase in contracting would reduce competition, while another 18 percent indicated that it would lead to lower prices for cattle (Table 6.26). Some respondents (3.8 percent) believed that the auction market would never

Table 6.26 Impact of Increased Contractual Arrangements

Impact	No. of Respondents	Percentage from total sample
Lower price	33	17.8
Reduce competition	47	25.4
Never totally replace auctions	7	3.8
No market for low quality cattle	3	1.6
Eliminate small producers	10	5.4
No opinion	37	20.0

Source: Survey

Note: Percentages do not add up to 100 because some respondents gave more than one response.

totally be replaced by contractual arrangements. A minority of respondents (27 percent) believed that contractual arrangements would not create problems for price discovery. Approximately four percent indicated that cattle prices are widely

available through mass media so that contractual arrangements would not create any pricing problems. Instead they regarded it as a method for reducing middlemen (Table 6.27). Other suggestions included were: (i) both parties will share the consequences - costs and benefits; and (ii) it would lead to a more efficient market.

Table 6.27 Suggestions Favouring Contractual Arrangements

Suggestion	No. of Respondent	Percentage from total sample
Consequences will shared	4	2.2
Reduce middlemen	4	2.2
Prices are widely available	8	4.3
More efficient market	4	2.1
No response	12	6.5

Source: Survey

Approximately four percent of respondents indicated that contractual arrangements would lead to more efficient markets. Although more than six percent of respondents favoured the emerging contractual arrangements in the beef industry, they do not give any reasons for this view. Further analyses were carried out to investigate whether contractual arrangements have any relationship to the size of the farm (number of cows) and the experience the producers have with beef cattle. The results did not provide sufficient evidence to support these relationships.

6.4.3 Alternative Production and Marketing Arrangements

(a) Preferences with Respect to Current Arrangements: A Conjoint Analysis

The method and the steps involved in conjoint analysis were discussed in detail in chapter 5. Although, the conjoint procedure component of the SPSS computer package produces results for each individual and an average result for an entire sample, for obvious reasons, it is not possible to discuss all 185 individual cases. However, for illustration purposes, the result of one individual is discussed. The average results for the entire sample are presented. The individual responses

may be important for a smaller group of producers but the average results may be more applicable for a study of industry-wide decisions where the purpose of this study is to determine industry-wide reactions to a change in one of the scenario's attributes.

Conjoint Results for an Individual

The part-worth estimates and the standard error for each attribute level, together with two statistics called Pearson's R and Kendall's tau statistics for one individual in the sample are presented in Table 6.28. The Pearson's R and Kendall's

Table 6.28 Part-worth Evaluations and Importance of Three Attributes for One Individual

Attribute	Part-worth evaluation	Relative importance of attribute
Type of cattle sold:		55.56
Weaned calves	0.1667 (0.4082)	
Backgrounded cattle	1.1667 (0.4787)	
Finish cattle	-1.1333 (0.4787)	
Nature of transaction:		16.67
Auction sale	-0.3750 (0.3062)	
Direct sale	0.3750 (0.3062)	
Specification requirements:		27.78
Willing to meet	0.6250 (0.3062)	
Not willing to meet	-0.6250 (0.3062)	

Constant	= 6.8333	
Pearson's R	= 0.908	Significance = 0.0009
Kendall's tau	= 0.866	Significance = 0.0024
Kendall's tau for two holdouts	= 1.000	

Source: Survey
Note: Numbers in parentheses are standard errors.

tau statistics indicate the validity of the estimated model, which is discussed as follows. The Pearson's R and Kendall's tau statistics, which are correlations between the observed and predicted preferences, provide an indication of how well the model fits the data. A statistic of one indicates a perfect positive relationship between predicted and actual preference scores whereas minus one indicates a perfect

negative relationship. For this particular individual, both these statistics are very high (over 85 percent), suggesting that the specified model (additive part-worth model) fits the data well.

Another measure of fit of the model is Kendall's tau statistic for the two hold-out scenarios. Hold-out scenarios are additional scenarios which are included with the scenarios obtained through fractional factorial design. The preference data from the hold-out scenarios are not included in the estimation of part-worth values of the attributes but are used to check the accuracy with which the model predicts each respondent's preference score for the hold-out scenarios by comparing the prediction with their actual preference scores. Kendall's tau statistics report the correlation between actual and predicted preferences. The statistic of one for this indicates the best fit of the data in the two-holdout scenarios to the specified model. Estimated part-worth values for each level of the three attributes are shown in the second column of Table 6.28.

Among the three stages of raising cattle (cow-calf, backgrounding and finishing), this individual derived the highest satisfaction by raising cattle up to the backgrounding stage. Direct sale gives him/her positive satisfaction (0.37) over the auction sale. This particular individual derived positive satisfaction (0.625) from producing cattle that meet requirements specified by buyers.

Since part-worth estimates are based on the common preference scale, these values can be added together to give a total evaluation for a particular scenario/s (Hair et. al., 1992). The most preferred marketing alternative for this individual is the one which gives him or her the highest part-worth evaluation. Backgrounded cattle that meet a buyer's specification and are sold directly to the buyer produce the highest total value (9), which is the sum of individual part worth values, including the constant term (1.1667 + 0.3750 + 0.6250 + 6.8333) (Table 6.28). The constant term is the average value for the eight scenarios. The scenario consisting of producing weaned calves, which meet a buyer's specification and which are sold directly to buyers, provided a total part-worth value of 8 (0.1667 + 0.3750 + 0.6250 + 6.8333). All other scenarios also provide total part-worth values that are less than

nine. Therefore, the most preferred marketing alternative for this individual is selling backgrounded cattle directly to the buyers, which meet their specifications.

The conjoint procedure of the SPSS software uses part-worth estimates to compute the relative importance for the factors or attributes (see section 5.4 of chapter 5). As shown in the third column of Table 6.28, the type of cattle sold was the most important attribute for this individual (55 percent) when choosing a particular marketing alternative. The specification requirement was the second most important attribute (28 percent), while the nature of the transaction was the third most important attribute (17 percent).

Conjoint Results for the Entire Sample

All individual part-worth estimates produced by the SPSS conjoint procedure were then used to compute the average part-worth and relative importance of factors (or attributes) for the entire sample. These statistics are the overall averages of all individual part-worth estimates. Interpretation of Pearson's R and Kendall's tau statistics for the entire sample are the same as discussed for the individual case. Both the Pearson's R and Kendall's tau statistics take the value of one, implying the additive part-worth model fits the data well for the entire sample. Producers preferred to produce backgrounded cattle (0.206) rather than weaned calves (-0.0275) and finished cattle (-0.1786) (Table 6.29). Selling cattle at an auction market was preferred (0.0632) over direct sale (-0.0632). These results are consistent with the the results obtained in section 6.3.3 where more than 76 percent of producers sold backgrounded cattle at auction markets. Producers tended to prefer a marketing channel which required them to meet the specifications of buyers, which is also consistent with the results discussed under section 6.4.2 where more than 75 percent of producers were willing to cooperate with buyers. Respondents regarded specification requirements as the most important attribute (48 percent) when choosing a marketing channel, followed by the type of cattle sold (33 percent) and the nature of transaction (19 percent).

Table 6.29 Average Part-worth Evaluations and Importance of Attributes for the Entire Sample

Attribute	Part-worth evaluation	Relative importance of attribute
Type of cattle sold:		32.92
Weaned calves	- 0.0275	
Backgrounded cattle	0.2060	
Finish cattle	-0.1786	
Nature of transaction:		19.35
Auction sale	0.0632	
Direct sale	-0.0632	
Specification requirements:		47.72
Willing to meet	1.7280	
Not willing to meet	-1.7280	

Constant	= 6.052	
Pearson's R	= 1.000	Significance = 0.0000
Kendall's tau	= 1.000	Significance = 0.0003
Kendall's tau for two holdouts	= 1.000	

Source: Survey

As described in the individual analysis, the part-worth evaluations can be added to give total evaluations for any particular scenario. For example, selling weaned calves at an auction and being willing to meet buyers' specifications produces a total evaluation of 7.81. This is the sum of the part-worth estimates of the attribute levels of this case and constant term (–0.0275 +0.0632 + 1.7280 + 6.0522). Here, the constant term is the average of the respondent's preference scores for the eight cases. Table 6.30 reports the total evaluations for all cases (excluding the two hold-out cases) included in the survey.

If one attribute is preferred over another, it receives a larger part-worth value. Similarly, if a particular case is preferred over another, it receives a larger preference score. Accordingly, case number three, as stated in Table 6.30, is the preferred alternative.

In addition, the preference scores indicate the manner in which cow-calf producer's trade off between attribute levels when choosing a particular marketing alternative. For example, cases 6 and 7 were ranked as third and fourth, respectively. Both cases involved direct sales but case 6 involved selling weaned calves without

Table 6.30 Preference Scores and the Ranking of Cases

Case*	Predicted preference score	Predicted rank
1	7.81	2
2	4.23	7
3	8.05	1
4	4.36	6
5	4.21	8
6	7.69	3
7	7.54	4
8	4.47	5

* Where the cases are:

Case	Type of cattle	Meet specification	Nature of transaction
1	Weaned	Yes	Auction
2	Weaned	No	Direct
3	Backgrounded	Yes	Auction
4	Weaned	No	Auction
5	Finished	No	Auction
6	Weaned	No	Direct
7	Finished	Yes	Direct
8	Backgrounded	No	Direct

Source: Survey

meeting buyer specifications. Case 7 involved selling finished cattle while meeting buyers specifications. This result suggests that respondents, on average, traded off (or gave up) willingness to meet specifications for the option of producing weaned calves rather than finished cattle. Another example is cases 3 and 4, which were ranked first and sixth, respectively. Both cases included auction sales but case 3 involved producing backgrounded cattle while meeting buyers' specifications. Case 4 involved producing weaned calves without meeting buyers' specifications. Ranking case 3 as the most preferred alternative suggests that producers were willing to trade off selling weaned calves for the option of meeting buyer specifications. A similar conclusion can be made with cases 3 and 5 where producers were willing to give-up integration of the finishing function for the option of meeting buyer specifications.

It may be possible to interpret producers' preferences to meet specifications as their desire to reduce the transaction costs involved in searching for new buyers or better prices for their cattle. That is, once they meet product specifications they tend to develop trust with buyers and sellers, which will eventually reduce the buyers' uncertainty with regards to quality attributes. The implication of willingness to meet buyers' specification is the development of contractual arrangements with buyers.

(b) Two Australian Models of Alternative Arrangements

As discussed in chapter 3, in response to consumer demand, Australia has taken two major approaches (or initiatives) called Marketlink and Meat standard Australia (MSA), in recent years to improve the quality and efficiency of the beef production and marketing system. The Marketlink program encourages coordination of the entire beef supply chain through alliances. The MSA emerged as an alternative program responding to the loss of export market share to higher quality U.S., beef it establishes 'pathways' for beef.

In this study an attempt was made to obtain Saskatchewan beef producers' attitudes toward these two types of programs. With respect to the Marketlink program, the following description was given and producers were asked to rate pre-defined drawbacks and benefits on a five-point scale (1 = unimportant, 2 = somewhat unimportant, 3 = important, 4 = somewhat important, 5 = important).

> *"Beef producers may join one or more alliances involving cow-calf operators, backgrounders, feedlots, a packing plant and (may be) retailers. Each alliance determines a set of production requirements for each participant designed to meet the demands of the consumer on eating quality and food safety as seen by the organizers of the alliance. Different alliances may have different production requirements. Producers will need to document their production practices, which will be subject to checking by a third party".*

Loss of independence, increased record keeping, inconvenience of third party verification, training for self and/or staff and increased capital investment were included in the survey as the main drawbacks of this approach. Average responses to these drawbacks including 't' values that measure the significant departure of average scores from mid point of the scale (3) are summarized in Table 6.31. The

Table 6.31 Number of Respondents, Average Scores and the 't' values for Main Drawbacks for the Marketlink Program

Main Drawbacks	No of respondents	Average score	't' value	Probability
Loss of independence	184	3.99 (1.11)	12.16	0.000
Increased in record keeping	183	3.58 (1.20)	6.54	0.000
Inconvenience in third party verification	184	3.88 (1.09)	10.95	0.000
Training for self / staff	184	3.27 (1.12)	3.29	0.001
Increased capital investment	184	3.80 (1.16)	9.43	0.000

Source: Survey

Note: Numbers in parentheses are standards deviations
All the 't' values are significant the 0.01 level because the probability of 't' values are less than 0.01.

average responses given for these drawbacks lie between 3 and 4 on the preference scale. All of the average scores are significantly different from the mid point of the rating scale (3) at the 0.01 level suggesting that producers tend to regard these as important drawbacks of this market alternative. Loss of independence was the highest priority drawback implying that producers value their independence to some extent while cooperating with other participants. This was further supported by ranking the inconvenience of third party verification as the next most important drawback. Increased capital investment, increased record keeping and training for self and/or staff were the next most important drawbacks seen for this program.

With respect to the main benefits, information feedback, more secure markets, improved consumer confidence, improved methods of processing, compliance with food legislation, price premium and a stronger link with trading partners were possible responses and respondents were asked to rate them according to their importance. The average scores for all these benefits lie between important (3) and somewhat important (4) of the 5-point rating scale (Table 6.32). All the

Table 6.32 Number of Respondent, Average Scores and 't' Values Attached to the Main Benefits of Marketlink Program

Main Benefits	No of Respondents	Average Score	't' Value	Probability
Information feedback	184	3.84 (1.17)	9.73	0.000
More secure market	184	3.84 (1.14)	9.93	0.000
Improved consumer confidence	184	4.00 (1.15)	11.74	0.000
Improved method of processing	184	3.52 (1.090	6.51	0.000
Compliance with food legislation	184	3.39 (1.17)	4.48	0.000
Price premium	184	4.00 (1.15)	11.74	0.000
Stronger link with the trade	184	3.72 (1.06)	9.14	0.000

Source: Survey
Note: Numbers in parentheses are standard deviations

average scores were significantly different from mid point of the scale (3) at the 0.01 level implying that this program enables producers to derive significant benefits. Both improved consumer confidence and price premium were ranked highest while more secure markets and information feedback were ranked second followed by a stronger link with trade and improved methods of buying.

The MSA program described in the survey was:

"Beef producers do not join alliances of the type in Approach 1. Instead, there is one single set of production requirements determined by the Canadian beef industry and designed to meet the demands of the consumer on eating quality and food safety. If producers meet these requirements, their cattle are graded at slaughter, otherwise they are ungraded and the meat is sold ungraded. Producers will need to document their production practices, which will be subject to checking by a third party".

This description closely resembles the MSA program described in Chapter 3. The objective of this question was to gauge beef producers' attitudes toward the MSA type program. Producers were given a similar set of drawbacks and benefits as Marketlink and asked to rate them on a similar scale. As with Marketlink, average responses to main drawbacks lie between important and somewhat important and were significantly different from mid point (3) of the rating scale (Table 6.33).

Table 6.33 Number of Respondents, Average Scores and 't' Values Attached to the Main Drawbacks of the MSA Program

Main drawbacks	No of respondents	Average score	't' value	Probability
Loss of independence	184	3.48 (1.28)	5.14	0.000
Increased in record keeping	184	3.52 (1.18)	5.95	0.000
Inconvenience in third party verification	184	3.77 (1.07)	9.70	0.000
Training for self / staff	184	3.39 (0.99)	5.31	0.000
Increased capital investment	184	3.53 (1.12)	6.47	0.000

Source: Survey
Note: Numbers in parentheses are standard deviations

On average, producers' rate the inconvenience of third party verification as a primary drawback. Increased capital investment and record keeping received second and third priority followed by loss of independence and training for self and/or staff. All the average scores for the main benefits were significantly different from the mid point of the scale at the 0.01 level (Table 6.34). Producers tended to regard a price premium as the most important benefit, while compliance with food legislation and improved consumer confidence were the next most important benefits.

In summary, producers tend to rank loss of independence and inconvenience of third party verification as the most important drawbacks for both programs. By looking at the descriptions given above for the two programs, it was not surprising that these two were the main drawbacks, if producers are really concerned about the

Table 6.34 Number of Respondents, Average Scores and 't' Values Attached to the Main Benefits of the MSA Program

Main benefits	No of respondents	Average score	't' value	Probability
Information feedback	184	3.55 (1.10)	6.76	0.000
More secure market	184	3.53 (1.11)	6.50	0.000
Improved consumer Confidence	184	3.63 (1.06)	8.00	0.000
Improved method of processing	184	3.45 (1.04)	5.79	0.000
Compliance with food legislation	184	3.66 (3.17)	2.81	0.005
Price premium	184	3.67 (1.19)	7.62	0.000
Stronger link with the trade	184	3.45 (1.03)	5.91	0.000

Source: Survey
Note: Numbers in parentheses are standard deviations

independence of their beef operations. A potential price premium was the most important benefit of both approaches. Improved consumer confidence and information feedback were the next most important benefits seen for Marketlink, while it was compliance with food legislation and improved consumer confidence for the MSA program.

Comparison of Drawbacks between Marketlink and MSA

A comparison of the drawbacks for the two programs (Marketlink and MSA) using a 't' test is presented in Table 35. The basic motivation of this analysis is to evaluate whether the Marketlink program is more costly (or less preferred) than the MSA program. Results show that loss of independence and capital investments are

highly significant at 0.01 level suggesting that producers tended to rate Marketlink program better than the MSA in terms of these two drawbacks.

Table 6.35 Comparison of Drawbacks between Marketlink and MSA Programs

Drawbacks	Mean difference	't' value	Probability
Loss of independence	0.510 (1.33)	5.208	0.000
Increase in Record keeping	0.065 (1.17)	0.755	0.451
Inconvenience in third party verification	0.11 (1.11)	1.327	0.186
Training for self/staff	-0.2 (0.98)	-1.585	0.115
Increased capital investment	0.27 (1.15)	3.142	0.002

Source: Survey

Note: Numbers in parentheses are standard errors.

Comparison of Benefits between Marketlink and MSA

A similar 't' test analysis was carried out to investigate whether the Marketlink program or the MSA program provides more benefits. Interestingly, all the benefits except improved method of processing and compliance with food legislation were highly significant at the 0.01 level (Table 6.36). This suggests that although producers tended to regard the drawbacks of the Marketlink program as more significant than those of the MSA program, they believed that the Marketlink program could provide larger benefits in the areas of information feedback, more secure markets, improved consumer confidence, a price premium and a stronger link with trade than the MSA program. Stated differently, Marketlink is regarded as having bigger drawbacks than MSA but, on the other hand, it is seem to have more important benefits too. This suggests that the perceived benefits outweigh the perceived drawbacks of Marketlink.

Table 6.36 Comparison of Benefits between Marketlink and MSA Programs

Drawbacks	Mean difference	't' value	Probability
Information feedback	0.29 (1.12)	3.628	0.000
More secure market	0.31 (1.20)	3.490	0.001
Improved consumer confidence	0.37 (1.23)	4.061	0.000
Improved method of processing	0.08 (1.17)	1.008	0.315
Compliance with food legislation	-0.27 (3.18)	-1.183	0.238
Price premium	0.33 (1.04)	4.449	0.000
Stronger link with trade	0.27 (0.99)	3.782	0.000

Source: Survey

Note: Numbers in parentheses are standard errors

Emergence of These Two Approaches in Saskatchewan over the Next 5 years

The discussion in the previous sections has provided insight into how beef produces gauge changes in the industry. The next step was to assess producers' expectations for these two programs. Producers were asked the following question.

> *"Do you think that either or both of these two approaches will emerge in Saskatchewan in the next 5 years"*

The majority of respondents' (56 percent) indicated that these programs would not emerge in Saskatchewan over the next 5 years (Table 6.37). Another 26 percent indicated that approach 1 would emerge while 16 percent stated that approach 2 would emerge. Only two percent of respondents indicated that both programs would emerge in Saskatchewan.

The producers were then asked the following question to reveal their preference for the two approaches discussed above.

> *"Which of the two approaches would you prefer".*

Table 6.37 Opinions Toward Emergence of Marketlink, MSA or Both Programs

Approach	No. of respondents	Percentage
Approach 1 will emerge	48	26.1
Approach 2 will emerge	29	15.8
Both approaches	4	2.2
Neither approach	103	55.9
Total	184	100.0

Source: Survey

Forty one percent of the respondents favoured approach one while 28 percent favoured approach two (Table 6.38). The remaining 31 percent of respondents did not favour either approach.

Table 6.38 Preference for the Marketlink and MSA Programs

Approach	No .of respondent	Percentage
Approach 1 (Marketlink)	74	40.6
Approach 2 (MSA)	51	28.1
Neither approach	57	31.3
Total	182	100.0

Source: Survey

In summary, respondents tended to recognize the potential major drawbacks and benefits of these two programs. In comparison to the MSA program, the Marketlink program is more costly in terms of loss of independence and capital investment but they tended to believe that the Marketlink program would provide higher benefits than MSA program. The majority of producers did not believe that either of these approaches will emerge over the next five years, but approximately 41 percent of respondents prefer Marketlink (approach one), as opposed to 28 percent for MSA (approach two).

6.4.5 Other Alternative Arrangements

Beef producers were asked what changes they expected to see in the beef industry over the next ten years and their willingness to participate in such changes. Producers were asked to identify the following possibilities in terms of 'will it happen', 'should it happen' and 'if it did happen, would you participate'.

1. Joint ownership by cow-calf producers of feedlots or packing plants
2. On-farm quality assurance programs requiring documentation and verification by an independent third party
3. Individual animal identification to provide carcass characteristics to feedlots, backgrounders and cow-calf operators
4. Individual carcass-based pricing
5. Differential pricing for carcasses based on eating quality.

One interesting feature of these results was that, in some cases, the responses for 'will it happen' were lower than that of 'should it happen' and 'would you participate' (Table 6.39). For example, 67 percent felt that joint ownership of feedlots would happen, while approximately 70 percent of respondents felt it should happen and 57 percent would be willing to participate.

Producers generally did not feel that joint ownership of packing plants would occur. Only 26 percent of respondents believed that it would happen, but 48 percent of respondents felt it should happen. However, only 36 percent of respondents were prepared to participate, although this is still over a third of responses. It may not take a high percentage of producers to make a producer owned slaughter facility feasible. However, a key factor is the number of cattle which interested producers could commit to a slaughter facility, not simply the number of producers which make it feasible. This study, however, did not attempt to go deeply into the question of how they would participate or how they would find the necessary capital.

Approximately 35 percent of respondents tended to believe that a quality assurance program requiring documentation and verification by an independent third party would emerge over the next ten years and approximately 44 percent of respondents were willing to participate on such a quality assurance program.

Table 6.39 Producers Perceptions to Different Production, Marketing and Quality Assurance Programs (Number of Respondents)

Alternative arrangements	Will it happen	Should it happen	Would you participate
Joint ownership of feedlots	123 (67)	132 (71)	106 (57)
Joint ownership of packing plants	48 (26)	89 (48)	66 (36)
Quality assurance program requiring documentation and verification by an independent third party	65 (35)	82 (44)	82 (44)
Individual animal identification to provide carcass information to the producers	140 (76)	151 (82)	149 (81)
Individual carcass-based pricing	126 (68)	142 (77)	141 (76)
Differential pricing for carcasses based on eating quality	119 (64)	150 (81)	151 (82)

Source: Survey
Note: Numbers in parentheses are percentages from the total usable surveys (185)

A high percentage of respondents (76 percent) believed that an individual animal identification system to provide carcass information to producers would happen over the next 10 years. However, 82 percent of respondents indicated that 'it should happen', and 81 percent were prepared to participate in such a program. Again, the question of the nature of that participation was not addressed and would need further investigation.

Approximately 68 percent believed that an individual carcass-based pricing system would occur over the next ten years while about 77 percent believed it should happen and 76 percent were willing to participate. Similarly a high percentage of respondents (64 percent) believed that differential pricing for carcasses based on eating quality would emerge over the next decade but more than 80 percent of respondents thought it should happen and were also prepared to participate.

In essence, producers stated that they would like to see the emergence of programs such as joint ownership of feedlots, individual animal identification to provide carcass information to producers, individual carcass-based pricing programs

and differential pricing for carcasses based on eating quality. This is a positive sign for the development of a more coordinated quality assurance program in the Saskatchewan beef industry.

6.5 Summary

Results show that the Saskatchewan cow-calf sector is characterized by a somewhat large number of producers with herd sizes in the range of 50 – 100 cows (29 percent). On average, beef cattle producers have about thirty years of experience in beef cattle farming. The majority of cow-calf producers (55 percent) are cow-calf plus backgrounding operators. Beef cattle finishing on the farm is not common and this is limited to small-scale operations.

Approximately 47 percent of respondents said that they specialized in a particular breed whereas 33 percent of respondents do not specialize in any breed. The most common breeding strategy was the use of owned bulls. Hereford and Black Angus were the most common breeds.

In terms of farm cash receipts, Saskatchewan beef enterprises ranked third behind wheat and canola in 1996. The survey results indicate that approximately 60 percent of respondents said that they generate more than 50 percent of their family net income from their beef cattle enterprise.

The attitude of cow-calf producers towards alternative marketing arrangements and the satisfaction they derive from these alternatives were analyzed. Although, auction markets, order buyers and verbal arrangements were the most common market alternatives in selling weaned calves, producers' tended to prefer the auction market and order buyers when the transaction involved a somewhat large number of animals. A large majority of respondents (80 percent) said that they use an auction market for selling backgrounded cattle. Those who raised cattle to the finishing stage choose auction markets and verbal arrangements.

Producers were questioned about the future of the Saskatchewan beef industry. A large majority of respondents (81 percent) recognized that declining per capita beef consumption is a problem for the future development of the industry.

Their belief is that declining beef consumption would lead to less demand for beef causing them to find new markets especially international markets.

Producers were also asked for opinions on possible causes for the decline in beef consumption in North America. Among the different alternatives, the highest priority was assigned to lack of promotion, not meeting the quality of beef that the consumer wants, rising health consciousness and a relatively higher beef price. Although producers believed that the quality of higher price beef cuts in North America is inconsistent, they have confidence about the future of the beef industry. This is a positive sign for the development of quality assurance schemes in Saskatchewan.

The study then looked at cow-calf producers' expectations for changes in the Saskatchewan beef industry over the next ten years. Producers stated that they would like to see the emergence of programs such as joint ownership of feedlots, individual animal identification to provide carcass information to producers and differential pricing for carcasses based on eating quality. The majority of producers (64 percent) recognized the need for linkages between the various sectors of the beef industry, which is a good sign for the development of a more coordinated beef industry.

Respondents were asked to state the opinion about the two Australian market alternatives: Marketlink and MSA. The majority of producers recognized the likely drawbacks and benefits of both approaches but they did not believe that either of these two approaches would emerge in Saskatchewan over the next five years. However, approximately 41 percent of respondents prefer the Marketlink type program as opposed to 28 percent for the MSA type program.

Respondents felt that increased horizontal and vertical cooperation were essential for the future prosperity of the Saskatchewan beef industry with relatively higher emphasis on vertical cooperation. The importance of the beef enterprise to their family net income and the number of years that have been involved in beef cattle farming were found to be important factors in positive attitudes towards increased horizontal and vertical cooperation of the Saskatchewan beef industry. Respondents were also asked to evaluate ten different marketing alternatives, (some

of which may be hypothetical) on the 1 –11 preference scale. Conjoint analysis was employed to investigate how producers trade off one attribute for another. The results indicated that raising cattle up to the backgrounding stage that meet specification requirements and selling at an auction market is the most preferred production and marketing alternative.

Although more than 70 percent of producers were highly positive regarding the need for increased cooperation (both horizontal and vertical), they are somewhat inconsistent with responses to the questions of contractual arrangements and price discovery, and in choosing alternative marketing arrangements. Conjoint analysis shows that auctions are preferred over direct sales although it is the least important attribute of the three attributes considered in the study. The above apparent contradiction could be explained as follows. Producers now recognize the need for increased vertical coordination where cattle would flow directly to the buyer by-passing the auction. But producers are concerned that this would reduce the effectiveness of the open price discovery auction system, that is, reducing competition. Therefore, there is a dilemma and the cow calf producers were not consistent in their answers.

CHAPTER 7
SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

7.1 Introduction

This chapter provides a summary, conclusions, policy implications and recommendations for further research. The chapter begins with a summary of the thesis, which includes a brief description of the methodology and the results of the study (Section 7.2). The main conclusions of the study are outlined in section 7.3. Policy implications are presented in section 7.4. Recommendations for further research are contained in section 7.5 while limitations of the study are discussed in section 7.6.

7.2 Summary

This study analyzed alternative production and marketing arrangements for the Saskatchewan beef industry where the focus was on the cow-calf sector. In chapter 2 the study began with a description of the Canadian beef industry and Saskatchewan beef industry, in particular the current production and marketing arrangements. According to the secondary data sources, mixed farm operations were common in Saskatchewan prior to the 1980's. However, the trend has been toward more specialized production in both grain and cattle. Over time, the beef cattle industry has been divided into several sub-sectors, including cow-calf, backgrounding and feedlots. Feedlots sell fed cattle to the packing sector, which then sells meat products to the wholesale and retail/food service sectors. These various sub-sectors exist as specialized production units in Saskatchewan. However, there are also production units, which combine two or more of these functions.

The main challenge to the future of the Saskatchewan beef industry was hypothesized to be in production and marketing arrangements associated with: (i) ensuring beef quality; and (ii) vertical and horizontal coordination. A discussion of

the Canadian approach to ensuring beef quality (grading system) and its attempts at improving coordination was presented in chapter 3. The Canadian approaches in these areas are compared with those in other countries, notably the United States and Australia.

There is a growing body of theoretical economic literature on the merits of increasing industry coordination. Among them, literature related to transaction costs was found to be the most relevant for this study and, therefore, was discussed in chapter 4. This discussion suggested a theoretical imperative for the Saskatchewan cow-calf sector to become more vertically coordinated in the future to assure the industry's economic viability. While chapters 2 to 4 suggested there are potential improvements possible in the production and marketing arrangements for the Saskatchewan beef industry, any improvements hinge importantly on the attitudes of producers in the industry to such improvements.

The centerpiece of the thesis was a survey of the cow-calf sector with a focus on producer attitudes to the current and future production and marketing arrangements. A survey questionnaire was mailed to 810 cattle producers in the province. The survey methodology is presented in chapter 5. An analysis and discussion of the results of the survey is contained in chapter 6.

The survey covered two main areas. The first area asked producers about their current production and marketing arrangements, which provided additional information to that provided in chapter 2 on the current production and marketing arrangements. Results show that Saskatchewan's cow-calf sector is fragmented and characterized by a large number of small producers. However, there is considerable integration of the cow-calf and backgrounding functions but not with finishing. Producers tended to use quality oriented management practices such as improved breeds and feed but there are very little attempts made at joint ventures or entering into contracts.

The second part of the questionnaire asked producers about their attitudes toward future production and marketing arrangements. This second area comprised three sub-areas, which included: (i) focus on the consumer, (ii) focus on the future of the Saskatchewan beef industry, and (iii) other alternative production and marketing

arrangements. A large majority of producers recognized that declining beef consumption was a problem for the future of the Saskatchewan beef industry. This was primarily seen as one of not producing the type of meat product which the consumer wants and also the lack of consistency of the products. Producers believed that an expansion of export market was one of the alternatives to overcome this problem.

Although there are some problems in the beef industry, such as a decline in beef consumption, the producers were highly optimistic about the future of the beef industry. They felt that increased vertical and horizontal cooperation were essential for the future prosperity of the Saskatchewan beef industry and thought that the development of ready-to-eat beef products was very important along with improvements in the quality/grading system. Producers tended to view the Australian Marketlink type program as resulting in a loss of independence, requiring higher capital investment, and inconvenience of third party verification compared to the program of Meat Standards Australia. However, respondents tended to prefer the Marketlink approach. There was a willingness to incur greater costs in return for achieving what they saw as greater benefits. Respondents also saw the Marketlink type program as being more likely to emerge in the next five years than the MSA type program. Producers recognized that a cattle identification program was an important initiative that would help producers make better production decisions. The producers also tended to prefer other initiatives which focussed on carcass-based pricing linked to eating quality. In addition, producers saw an important role for improved linkages between all sectors for the future prosperity of the Saskatchewan beef industry.

7.3 Conclusions

This study analyzed Saskatchewan's cow-calf producers' attitudes towards different industry coordination mechanisms. The evidence has been provided in three ways: (1) analysis of current production, marketing and expected changes in the beef industry; (2) analysis of producers' attitude towards different industry coordination mechanisms; and (3) conjoint analysis. These analyses provided

sufficient information to conclude that Saskatchewan's beef industry has a high potential for development of a quality oriented direct coordination mechanism. More specifically:

(1) The Saskatchewan Cow-calf sector is dominated by a large number of small-scale producers. Although it is largely a fragmented in nature, there is also considerable integration of cow-calf and backgrounding functions.

(2) The producers are optimistic about the beef industry and recognize the potential for improvements to make it competitive in the future. The main areas for suggested improvements were improving quality performance and improving vertical and horizontal coordination in the industry.

(3) This study provided insight into the importance of different coordination mechanisms in determining the organizational structure of firms. Direct contractual arrangements such as written and verbal agreements, are not as common at present, but are starting to emerge as an important coordination mechanism. Producers' preferences for meeting buyers' specifications warrant the possibility for the development of direct coordination mechanisms in Saskatchewan in future.

(4) The importance of beef cattle enterprises to the producers' net family income and the experience the producers have in beef cattle operations were found to be the most important factors for supporting increased horizontal and vertical coordination.

(5) At present, Marketlink and the MSA type programs were not perceived to be promising alternatives for the vertical organization of the beef industry in Saskatchewan. However, some modifications, such as removal of third party verifications and replacement by some other mechanisms such as pricing based on quality or a combination of Marketlink and MSA type programs could increase the chances of these types of alternatives emerging in the Saskatchewan beef industry.

(6) This study has shown that producers' preferences in choosing alternative marketing channels can be measured in terms of proxy measurements (Conjoint analysis).

7.4 Implications of the Results

This study has attempted to identify cow-calf producers' attitudes towards different organizational arrangements. The major implication of the results discussed in chapter 6 is that Saskatchewan beef producers are prepared to accept a more coordinated beef industry. Producers tended to prefer direct market alternatives when the transaction involves smaller numbers of cattle. Considering the small to medium size of operations in the province, direct contractual arrangements seem to be a promising marketing channel where they could achieve transactional cost efficiencies.

Another implication of this study is that there is potential for the introduction of a pricing scheme such as pricing of cattle based on carcass quality. This may require the provision of carcass information back to the producers.

Moreover, strong recognition by producers for the need for increased cooperation, coupled with a willingness to meet product specifications can be translated into two other policy implications. Firstly, it suggests the ability to launch vertically coordinated quality control programs in an attempt to meet product attributes as desired by consumers. However, this may have to be coupled with some type of incentive scheme, perhaps a price premium for higher quality products. Secondly, it also suggests the need for identification of critical points in the beef supply chain and then to develop a quality control program.

7.5 Recommendations for Further Research

The analysis carried out in this study is limited only to cow-calf producers' production, marketing and attitudes towards different industry coordination mechanisms. As the cow-calf sector is one segment of the beef supply chain, the results of this study can not be generalized to the entire beef industry. The attitude of participants of the other segments of the beef industry (i.e., feedlots, packing plants, wholesalers / retailers and consumers) with regards to current production, marketing and barriers to further improvements of these sectors needs to be investigated. In addition, attitudes toward different industry coordination mechanisms and the importance of different transaction cost variables for other sectors needs to be

investigated. In particular, a further disaggregation the various types of transactions into written contracts, verbal agreements and order buyer arrangements could increase the validity of the results. In addition, a more in depth investigation of the types of assistance producers were require from governmental or other institutions needs to be carried out.

7.6 Limitations of the Study

As noted earlier, questionnaires were sent to 810 farmers who are the members of the SSGA, of which 185 usable surveys were returned. The generalization of findings for the entire cow-calf sector of the Saskatchewan is, therefore, dependent on how well this sample of producers represents the general body of beef cattle producers in Saskatchewan.

Another limitation was the focus of the study, which was limited only to the cow-calf sector. However, complete and comprehensive analysis of vertical coordination should include the entire beef supply chain.

Although limitations are common to almost all modeling approaches, use of the additive part-worth main effect model used in the conjoint analysis causes several limitations. One limitation of the above model is the required assumption of no significant interaction effects between attribute levels. It is clear that interactions do exist, but in order to preserve the information overloading problem, accuracy of the estimates or predictive ability of the model and to increase the degrees of freedom of the parameters estimated, the interaction terms are left out of the estimation equation.

The other limitation of the conjoint analysis is the assumption that there is a strong correlation between attributes of a product or service and producer behaviour. However, choosing attributes that closely reflect their relationship reduces the limitation of the analysis arising from this assumption.

Another limitation of this analysis is related to the forecasting ability of the model. The information related to the coordination concepts or scenarios discussed above were obtained only for the levels of attributes included in the study. Thus, the forecasting ability of the model is limited only to the range of levels of attributes

considered in the model. Although an increase in number of independent variables in the conjoint model increases the information-overloading problem, inclusion of variables such as handling of cattle and uncertainty would improve the validity of the results.

REFERENCES

Akerlof, G. A. (1970). "The Market for Lemons: Quality Uncertainty and the Market Mechanism". Quarterly Journal of Economics, p. 489 – 500.

American Angus Association (1998). Leading the Branded Beef Industry: Certified Angus Beef Program. Annual Report.

Bain, J.S. (1968). Industrial Organization. University of California, New York, Wiley.

Barkema A. and M.L.Cook (1993). "The Changing U.S. Pork Industry: A Dilemma in Public Policy". Economic Review, Federal Reserve Bank of Kensas City. Second Quarter. P. 49 - 65.

Barkema A. and Drabenstott, M. (1995). "The Many Paths of Vertical Coordination: Structural Implications for the US Food System". Agribusiness, 11:483 - 492.

Barzel, Y. (1982). "Measurement Cost and the Organization of Markets". Journal of Law and Economics, 25: 27 – 47.

Bettman, J.R., N. Capon and R. Lutz (1975). "Multiattribute Measurement Models and Multiattribute Theory: Test of Construct Validity". Journal of Consumer Research, 1:1 - 15.

Boehlje, M. (1996). "Industrialization of Agriculture: What are the Implications?" Choices, First Quarter, pp. 30 - 33.

Benedict J. and E.M. Steenkamp (1987). "Conjoint Measurement in Ham Quality Evaluation. Journal of Agricultural Economics, 38: 473 – 480.

Binger, B.R. and E. Hoffman, (1988). Microeconomics with Calculus. HarperCollins Publishers.

Brester, G.w., Ted C. Schroeder and J. Mintert (1997). "Challenges to the Beef Industry". Choices, Fourth Quarter, pp. 20 - 25.

Brown, W.J., T.I. McNinch and J.S. Taylor, (1997a). The Industrial Reorganization of the Beef Production Industry: Saskatchewan's niche. A study prepared for the Beef Development Fund, Final Report. Department of Agricultural Economics, University of Saskatchewan, Canada, July.

Brown, W.J., T.I. McNinch, A.L. Skinner and J.S. Taylor, (1997b). Risk Efficient Feedlot Location in Saskatchewan, Department of Agricultural Economics, University of Saskatchewan, Canada, July.

Brown, W.J. (1998). Personal Communication, Department of Agricultural Economics, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

Canada Beef Export Federation, (1998). Beef Today, WWW.cbef.com/

Canadian Cattle Identification Agency, (1999). WWW. Cattle.ca/ccia, June 28, 1999

Carmone, F. J., P.E. Green and A.K. Jain (1978). "Robustness of Conjoint Analysis: Some Montecarlo Results". Journal of Marketing Research, 15: 300 - 303.

Carmone, F. J., and P.E. Gerrn (1981). "Model Misspecification in Multiattribute Parameter Estimation. Journal of Marketing Research, 18: 87 -93.

Cattin, P. and D.R. Wittink, (1982). "Commercial Use of Conjoint Analysis: A Survey". Journal of Marketing, 46: 44 – 53.

Coase R.H. (1937). "The Nature of the Firm". Economica, 4: 386 - 405.

Coghill, G.J. and W.J. Brown, (1998). Economic Production Potential of the Cow-Calf Herd in Saskatchewan, Department of Agricultural Economics, University of Saskatchewan, Canada, July.

Collins, N.R. (1959). "Changing Role of Price in Agricultural Marketing". Journal of Farm Economics, 41: 528 - 534.

Deaton A. and J. Muellbauer (1980). Economics and Consumer Behaviour. Cambridge University Press, Cambridge, UK.

Frank, S. D. and D. R. Henderson (1992). "Transaction Costs as Determinants of Vertical Coordination in the U.S. Food Industries". American Journal of Agricultural Economics, 74: 941 - 950.

Forsen, J. B., B. R. Ntare and F. Waliyar (1997). "Utilizing Conjoint Analysis to Design Modern Crop Varieties: Empirical Example for Groundnut in Niger". Agricultural Economics, 16: 219 - 226.

Green, P. E. and V. R. Rao (1971). "Conjoint Measurement of Quantifying Judgemental Data", Journal of Marketing Research, 8:355 - 365.

Green P. E. and Y. Wind (1975). "New Way to Measure Consumers' Judgements". Harward Business Review, 3:107 - 117.

Green P. E. (1984). "Hybrid Models for Conjoint analysis: An Expository Review". Journal of Marketing Research, 21:155 - 159.

Green P.E. and V. Srinivasan (1978). "Conjoint Analysis in Consumer Research: Issues and Outlook". Journal of Consumer Research. 5: 103 – 123.

Green P. E. and V. Srinivasan (1990). "Conjoint Analysis in Marketing: New Development with Implications for Research and Practice". Journal of Marketing, 54:3 -19.

Grossman, S. and O. Hart (1986). "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration". Journal of Political Economy, 94: 691 - 719.

Hair, J. F., R. E. Anderson and R. L. Tatham (1992). Multivariate Data Analysis with Readings. Third Edition, Macmillan Publishing Company, New York.

Hazell P.B.R. and R.D. Norton. (1986). Mathematical Programming for Economic Analysis in Agriculture, Macmillan Publishing Company, New York, NY 11122.

Hennessy, D. A. (1996). "Information Asymmetry as a Reason for Food Industry Vertical Coordination". American Journal of Agricultural Economics, 78(1996): 1034 - 1043.

Hobbs, J. E. and W. A. Kerr (1992). "Costs of Monitoring Food Safety and Vertical Coordination in Agribusiness: What Can be Learned from the British Food Safety Act 1990? Agribusiness 8: 575 - 584.

Hobbs, J. E. (1996a). "Transaction Costs and Slaughter Cattle Procurement: Processors' Selection of Supply Channels". Agribusiness 12: 509 - 523.

Hobbs, J. E. (1996b). "A Transaction Cost Analysis of Quality, Traceability and Animal Welfare Issues in UK Beef Retailing" British Food Journal, 98:16 - 26.

Hurt, C. (1994). "Industrialization in the Pork Industry". Choices, Fourth Quarter, pp. 9 - 13.

Jain, A. K., F. Acito, N. K. Malhotra and V. Mahajan (1979). "A Comparison of International Validity of Alternative Parameter Estimation Methods in Decompositional Multiattribute Preference Models". Journal of Marketing Research, 16: 313 - 322.

Jones R., T. Schroeder, J. Mintert, and F. Brazle. (1992). "The Impact of Quality on Cash Cattle Prices". Southern Journal of Agricultural Economics, 24:149 - 162.

Joskow, P. L. (1988). "Asset Specificity and the Structure of Vertical Relationships: Empirical Evidence". Journal of Law, Economics and Organization, 4: 95 -117.

June, L. P. and S. L. J. Smith (1987). "Service Attribute and Situational Effects on Customer Preferences for Restaurant Dining". Journal of Travel Research, Fall, pp. 25 – 36.

Kinsey, J. and B. Senaur (1997). "Food Marketing in the Electronic Age: Implication for Agriculture". Choices, Second Quarter, pp. 32 - 35.

King, R. P. (1992). "Measurement and Financing of Vertical Coordination in Agriculture: An overview". American Journal of Agricultural Economics, 74:1217 - 1218.

Kliebenstein, J. B. and J. D. Lawrence (1995). "Contracting and Vertical Coordination in the United States Pork Industry". American Journal of Agricultural Economics, 77:1213 - 1218.

Leigh, T. W.. D. B. MacKay and J. O. Summers (1984). "Reliability and Validity of Conjoint Analysis and Self-Explicated Weights: A Comparison". Journal of Marketing Research, 21:456 - 462.

Levy, D. (1985). "The Transaction Cost Approach to Vertical Integration: An Empirical Examination". Review of Economics and Statistics, 67: 438 - 445.

Leung, C.Y., S.N. Kulshreshtha and W.J. Brown (1991). Economies of Size in Beef Cattle Production in Saskatchewan. Saskatchewan Beef and Hog Sector Study Report 6. Department of Agricultural Economics, University of Saskatchewan, Saskatoon Saskatchewan, Canada.

Luce R.D. and J.W. Tukey (1964). "Simultaneous Conjoint Measurement: A New Type of Fundamental Measurements". Journal of Mathematical Psychology. No. 1. P. 1 – 27.

McDermott, A. K. and N. M. Shadbolt (1998). "Strategic Alliances for Competitive Viability in New Zealand Pastoral System", in Proceedings of the Third International Conference on Chain Management in Agribusiness and the food Industry, Edited by G. W. Ziggers, J. H. Trienekens, and P. J. P. Zuurbier. Management Studies Group, Wageningen Agricultural University. The Netherlands, May.

Mighell, R. L. and L. A. Jones (1963). Vertical Coordination in Agriculture, Agricultural Economic Report, No. 19, U.S. Department of Agriculture, Economic Research Services, February.

Miller, D. (1998). "Cattle Feeding in Saskatchewan: What is Our Potential", Proceedings of Saskatchewan Beef Symposium '98', Saskatoon, Saskatchewan, Canada, November 17 - 18,

Miller, D. (1998b). Personal Communication, Western Canadian Beef Packer, Moose Jaw, February, 1999.

Ness M. R. and H. Gerhardy (1994). "Consumer Preferences for Quality and Freshness Attributes of Eggs". British Food Journal, 96:26 -34.

Phlips, L. (1983). Applied consumption Analysis: Revised and Enlarged Edition. Ameterdam, North Holand Publishing Company.

Pinnacle Management, (1998). Supply Chain Management for Sustainable Global Competitiveness. An interim report prepared for the Department of Primary Industries and Energy in Support of Supermarket to Asia Council. March.

Reibstein, D., J. E. G. Bateson and W. Boulding (1988). "Conjoint Analysis Reliability: Empirical Findings". Marketing Science, 7:271 - 286.

Robison, L. J. and P. J. Barry (1987). Competitive Firm's Response to Risk, Macmillan Publishing Company, New York.

Royer, J. S. (1995). "Potential for Cooperative Involvement in Vertical Coordination and Value added Activities. Agribusiness, 1:473 - 481.

Saskatchewan Agriculture and Food, (1997). Agricultural Statistics, 1997. Statistics Branch, Regina, Saskatchewan, Canada.

Segal, M. N. (1982). "Reliability of Conjoint Analysis: Contrasting Data Collection Procedures". Journal of Marketing Research, 19:139 - 143.

Sporleder, T. L. (1992). "Managerial Economics of Vertically Coordinated Agricultural Firms". American Journal of Agricultural Economics, 74: 1226 - 1231.

Spriggs, J. (1995). The International Trade Environment and the Agrifood Industry (with implication for Saskatchewan). A Report Submitted to the Saskatchewan Agriculture and Development Fund. Dept. of Agricultural Economic, Univ. of Sask., Saskatchewan, Canada.

Spriggs, J. and J. Hobbs, (1998). Competitiveness of Canada's Beef Food Safety System", A report submitted to Agriculture and Agri-Food Canada, Policy Branch, Ottawa, Ontario, August.

SPSS, (1997). SPSS Conjoint™, 8.0, SPSS Inc., Chicago, USA.

Statistics Canada, (1997). Livestock Statistics, Agriculture Division.

Stigler, G.J. (1961). "The Economics of Information" The Journal of Political Economy, 3: LXIX: 25 – 64.

Streeter, D. H., S. T. Sonka and M. A. Hudson (1991). "Information Technology, Coordination and Competitiveness in the Food and Agribusiness Sector". American Journal of Agricultural Economics, 73:1465 - 1471.

Sturby, T. J. (1994). Canadian Feeder Cattle Exports to the United States: Can Price Differentials Explain. B.Sc. Agric. Thesis. Unpublished, Department of Agricultural Economics, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

Teegerstrom, T, G. D'Souza, p. Osborne and K. Jones, (1997). "To Contract or Not to Contract? A Decision Theory and Portfolio Analysis of Cattle Contract grazing, Agricultural and Resource Economics Review, pp. 205 - 215.

Thompson, J, (1998). "Grading – The Meat Standards Australia (MSA) Experience. A Paper presented at the Armidale Feeder Steer School, February 1998. Division of Animal Science, University of New England, Armidale, NSW 2351.

Unnevehr, L. J. and S. Bard, (1993). "Beef Quality: Will Consumers Pay for Less?" Journal of Agricultural and Resource Economics, 18:285 - 295.

Urban, T.N. (1991). "Agricultural Industrialization: It's Inevitable". Choices, Fourth Quarter, p.4 - 6.

Urban, T.N. (1998). "Beyond Industrialization: The Prescription Food System" Choices, Fourth Quarter, p. 43 – 45.

Van Duren, E., W. Howard and H. McKay (1995). "Forging Vertical Strategic Alliances". Choices, Second Quarter, p. 31 - 33.

Varian, H. R. (1990). Intermediate Microeconomics: A Modern approach, Second Edition, W.W. Norton and company, New York.

Walker, G. and D. Weber. (1984). "A Transaction Cost Approach to Make or Buy Decisions". Administrative Science Quarterly. 29:373 - 391.

The WEFA GROUP, (1993). Saskatchewan Red Meat Industry Study. A Report Prepared for the Saskatchewan Livestock Policy Advisory Council.

The Western Producer, (1997). "Special Deals Undermine Price Discovery". June 5, p. 13.

Wilson, N. (1996). "The Supply Chains of Perishable Products in Northern Europe". British Food Journal, 98:9 - 15.

Williamson, O. E. (1979). "Transaction Cost Economics: The Governance of Contractual Relations". Journal of Law and Economics, 22:233 - 262.

Williamson, O. E. (1986). "Economic Organization - Firms. Markets and Policy Control". Wheatsheaf Books.

World Bank, (1998). "Global Economic Prospects and the Developing Countries" WWW. World Bank, September 10.

Wright, P. (1975). "Consumers Choice Strategies: Simplifying Vs. Optimizing". Journal of Marking Research, 12:60 - 67.

WWW.harrisranchbeef.com, April 20, 1998.

Zwart, T.1998. "Transaction Cost Model of Marketing Channel Relationship. In Agribusiness and the Food Industry Edited by G. W. Ziggers, J. H. Trienekens, and P. J. P. Zuurbier. Management Studies Group, Wageningen Agricultural University. The Netherlands, May, pp. 449 – 459.

ANNEXES

Appendix A

Beef Producer Survey

(A) Please indicate which of the following best describes your operation today? (please tick one only)

- ☐ Cow-calf only
- ☐ Cow-calf + Backgrounding
- ☐ Cow-calf + Backgrounding + Finishing
- ☐ Backgrounding only
- ☐ Backgrounding + Finishing
- ☐ Finishing only
- ☐ None of the above

If you have ticked None of the above, this is the end of the survey. Please return survey in the prepaid envelope provided. Thank you. Otherwise please continue.

Section A: Production and Marketing Arrangements

(1) a). **Breeding stock:** How many bulls and cows did you have on your farm in 1998 and 1999.

Type of animal	On January 1, 1998	On January 1, 1999
Bulls		
Cows		

(b). **In 1998,**

i. How many calves did you wean? .....
ii. How many cattle did you background? .....
iii. How many cattle did you finish to slaughter weight? .....
iv. How many cattle did you have in community pasture including:
Cows .....
Calves .....
Other (specify) .....
v. How many of your cows were bred by:
Owned bulls .....
Rented bulls .....
Community pasture bulls .....
Artificial Insemination (AI) .....
vi. How many cattle did you lease? .....

(2) If you are a cow-calf producer, do you specialize in a particular breed?

☐ Yes. Please indicate breed(s) and number of cattle in each breed?

.....

☐ No.

(3) What percentage of your family net income (from farm enterprises only) comes from your beef enterprise? .....%

(4). How long you have been involved in beef cattle producing? ..... Years.

(5) A). **In 1998**, did you buy weaned calves for backgrounding?

☐ No (please go to question (6))

☐ Yes.

(B). If yes, **how many** weaned calves did you purchase by the following methods? Indicate your **level of satisfaction** with each method used.

	Number	Very Dissatisfactory				Very Satisfactory
i. Auction	.....	1	2	3	4	5
ii. Direct purchase from cow-calf producers by:						
a. written contract	.....	1	2	3	4	5
b. ongoing verbal arrangement	.....	1	2	3	4	5
c. through order buyer	.....	1	2	3	4	5
d. other (please specify)	.....	1	2	3	4	5
e. other (please specify)	.....	1	2	3	4	5

(B) If you are not fully satisfied with the current purchasing arrangements, what improvements are needed? Please list.

.....

.....

(6). Have you made any changes to your beef enterprise over the last 3 years? (Tick as many as apply)

- ☐ Improved feed quality
- ☐ Improved veterinary care
- ☐ Maintained records for each animal
- ☐ Supplementary feed
- ☐ Improved breeding stock
- ☐ Started a joint venture
- ☐ Entered into a written contract or ongoing verbal arrangements for sale of cattle
- ☐ Changed grain land to pasture land
- ☐ Increased herd size
- ☐ Decreased herd size
- ☐ Other (please specify)

.....

(7). Please indicates the extent to which you agree or disagree with the following statements. (Please circle appropriate number).

(a) "Increased cooperation among cow-calf producers is essential for the future prosperity of the Saskatchewan beef industry".

Strongly Disagree		Indifferent		Strongly Agree
1	2	3	4	5

(b) "Increased cooperation between buyers and sellers is essential for the future prosperity of the beef industry".

Strongly Disagree		Indifferent		Strongly Agree
1	2	3	4	5

(c) "The quality of higher-priced cuts of beef is inconsistent and the North American consumer has no real guarantee of eating quality".

Strongly Disagree		Indifferent		Strongly Agree
1	2	3	4	5

(8) a. How did you sell your weaned calves in 1998? Please indicate the number of weaned calves you sold and the level of satisfaction with each method used? (If you did not sell weaned calves go to (9)).

	Number	Very Dissatisfactory				Very Satisfactory
i. Auction	.....	1	2	3	4	5
ii. Direct sale to backgrounders or feedlots with:						
a. written contract	.....	1	2	3	4	5
b. ongoing verbal arrangement	.....	1	2	3	4	5
c. through order buyer	.....	1	2	3	4	5
d. other (please specify)	.....	1	2	3	4	5
.....						
e. other (please specify)	.....	1	2	3	4	5
.....						

If you are not fully satisfied with the current purchasing arrangements, what improvements are needed? Please list.

.....

.....

(9) How did you sell your backgrounded feeders in 1998? Please indicate the number feeders you sold and the level of satisfaction with each method used? (If you did not sell backgrounded feeders go to (10)

	Number	Very Dissatisfactory				Very Satisfactory
i. Auction	.....	1	2	3	4	5
ii. Direct selling to feedlots by:						
a. written contract	.....	1	2	3	4	5
b. ongoing verbal arrangement	.....	1	2	3	4	5
c. through order buyer	.....	1	2	3	4	5
d. other (please specify)	.....	1	2	3	4	5
.....						
e. other (please specify)	.....	1	2	3	4	5
.....						

If you are not fully satisfied with the current selling arrangements for backgrounded feeders, what improvements are needed? Please list.

.....

.....

(10) a. How did you sell your finished cattle in 1998? Please indicate the number of finished cattle you sold and the level of satisfaction with each method used? (if you did not sell finished cattle go to (11)).

	Number	Very Dissatisfactory				Very Satisfactory
i. Auction	.....	1	2	3	4	5
ii. Direct selling to packers by:						
a. written contract	.....	1	2	3	4	5
b. ongoing verbal arrangement	.....	1	2	3	4	5
c. through order buyer	.....	1	2	3	4	5
d. other (please specify)	.....	1	2	3	4	5
.....						
e. other (please specify)	.....	1	2	3	4	5
.....						

If you are not fully satisfied with the current selling arrangements for finished cattle, what improvements are needed? Please list.

.....

.....

Section B. Future of the Beef Industry?

(11). Statistics show that beef consumption per person is declining in North America. Why do you think this is happening? Please score the following in terms of their importance?

	Not at all Important				Critically Important
1. Rising health consciousness of consumers?	1	2	3	4	5
2. Price of beef is higher relative to the price of other meat?	1	2	3	4	5
3. Not producing the quality of beef (e.g. tenderness, juiciness) that the consumer wants?	1	2	3	4	5
4. Lack of ready-to-eat beef products?	1	2	3	4	5
5. Lack of promotion / advertising?	1	2	3	4	5
6. Other (please specify)	1	2	3	4	5

(12). Do you think the declining beef consumption per person in North America is a problem for the future of Saskatchewan's beef industry?

☐ No, Please explain:

.....

.....

☐ Yes, Please explain:

.....

.....

(13). How optimistic are you about the future of Saskatchewan's beef industry? Please circle appropriate number.

Very pessimistic		Indifferent		Very Optimistic
1	2	3	4	5

(14). Please score the following options for improvement of Saskatchewan's beef industry in terms of their importance.

	No at all Important				Critically Important
1. Individual carcass-based pricing	1	2	3	4	5
2. Traceability of animal to the farm of origin	1	2	3	4	5
3. Change in grading and/or marketing system to better reflect eating quality	1	2	3	4	5
4. Incorporation of quality assurance scheme in production and processing	1	2	3	4	5
5. Development of ready-to-eat beef products	1	2	3	4	5
6. Increased expenditure by industry for beef production	1	2	3	4	5
7. Other (please specify)	1	2	3	4	5

(15). There are a number of ideas on the horizon that, if introduced, could change the shape of the Saskatchewan beef industry. Looking forward over the next 10 years, consider each idea listed below and tell us whether you think: (a) it will happen; (b) it should happen; and (c) if it did happen, would you participate? **Please circle Y (yes) or N (No) for each.**

	Will it happen?	Should it happen?	Would you participate?
i. Joint ownership by cow-calf producers of:			
a. feedlots	Y / N	Y / N	Y / N
b. packing plants	Y / N	Y / N	Y / N
ii. On-farm quality assurance program requiring documentation and verification by an independent third party	Y / N	Y / N	Y / N
iii. Individual animal identification to provide carcass characteristics to feedlots, backgrounders and cow-calf operators	Y / N	Y / N	Y / N
iv. Individual carcass-based pricing	Y / N	Y / N	Y / N
v. Differential pricing for carcasses based on eating quality	Y / N	Y / N	Y / N
vi. Other (please specify)	Y / N	Y / N	Y / N

(16). Which activities, if any, of the Saskatchewan beef industry needs to be significantly improved if the industry is to be globally competitive. For the ones you tick, could you please briefly explain what change(s) you think are most needed.

Changes needed

☐ Cow-calf .....
.....

☐ Backgrounding .....
.....

☐ Feedlot .....
.....

☐ Packing / further processing .....
.....

☐ Distribution .....
.....

☐ Wholesale and retail .....
.....

☐ Linkages (e.g. joint investments, contracts, strategic alliances, etc.) between any of the above activities. Please tick appropriate one/s.

- ☐ No linkages needed
- ☐ Cow-calf and backgrounders
- ☐ Backgrounders and feedlot
- ☐ Feedlot and packer
- ☐ Other (please specify) .....

(17). Recently, there has been considerable talk about producers being more responsive to the demands of the consumer. We would like you to take a look at two different approaches as outlined below and tell us what you think of them which you would prefer, and what are the benefits and drawbacks of each.

Approach 1: Beef producers may join one or more alliances involving cow-calf operators, backgrounders, feedlots, a packing plant and (maybe) retailers. Each alliance determines a set of production requirements for each participant designed to meet the demands of the consumer on eating quality and food safety as seen by the organizers of the alliance. Different alliances may have different production

requirements. Producers will need to document their production practices, which will be subject to checking by a third party.

(i) In your opinion, what are the major drawbacks and benefits of this approach? Please circle appropriate number for those you feel most important.

(A) Main drawbacks:	Level of Important Least				Most
Loss of independence	1	2	3	4	5
Increase in record keeping	1	2	3	4	5
Inconvenience of third party verification	1	2	3	4	5
Training for self and/or staff	1	2	3	4	5
Increased capital investment	1	2	3	4	5
Other (specify)	1	2	3	4	5
.....					

(B) Main benefits:					
Information feedback	1	2	3	4	5
More secure markets	1	2	3	4	5
Improved consumer confidence	1	2	3	4	5
Improved method of processing	1	2	3	4	5
Compliance with food legislation	1	2	3	4	5
Price premium	1	2	3	4	5
Stronger link with the trade	1	2	3	4	5
Other (specify)	1	2	3	4	5
.....					

Approach 2: Beef producers do **not** join alliances of the type in Approach 1. Instead, there is one single set of production requirements determined by the Canadian beef industry and designed to meet the demands of the consumer on eating quality and food safety. If producers meet these requirements, their cattle are graded at slaughter, otherwise they are ungraded and the meat is sold ungraded. Producers will need to document their production practices, which will be subject to checking by a third party.

In your opinion, what are the major drawbacks and benefits of this approach? Please circle appropriate number for those you feel most important.

(A) Main drawbacks:	Level of Important				
	Least				Most
Loss of independence	1	2	3	4	5
Increase in record keeping	1	2	3	4	5
Inconvenience of third party verification	1	2	3	4	5
Training for self and/or staff	1	2	3	4	5
Increased capital investment	1	2	3	4	5
Other (specify)	1	2	3	4	5
.....					

(B) Main benefits:

Information feedback	1	2	3	4	5
More secure markets	1	2	3	4	5
Improved consumer confidence	1	2	3	4	5
Improved method of processing	1	2	3	4	5
Compliance with food legislation	1	2	3	4	5
Price premium	1	2	3	4	5
Stronger link with the trade	1	2	3	4	5
Other (specify)	1	2	3	4	5
.....					

(a). Do you think that either or both of these two approaches **will emerge** in Saskatchewan in the next 5 years?

- ☐ No, will not emerge.
- ☐ Yes. If yes, tick one or both boxes below:
  - ☐ Approach 1 will emerge.
  - ☐ Approach 2 will emerge.

(b). Which of the 2 approaches would you prefer?

☐ Approach 1 ☐ Approach 2 ☐ Neither approach

(18). If the use of auction markets for feeder cattle / finished cattle decline and is replaced by direct contracting, do you feel this will create a problem for adequate price discovery of cattle marketed?

- ☐ Yes, Please explain? .....
  ....
- ☐ No, Please explain? .....
  .....

(19) Suppose you are a cow-calf producer and face a number of alternatives marketing choices. These include:

(a) **sell weaned calves** or **retain calves** to **background** or **finish**.

(b) sell cattle at **auction** or through **direct sale** to buyer (including through an order buyer)

(c) **willing** to meet specific buyer requirements (e.g. on breed type, feeding practices) or **not willing** to meet these requirements.

Please indicate your preferences to the following choices using a scale of 1= Least preferred at all to 11= Most preferred). Before rating each choice, please read all 10 choices first and then proceed to answer number 1- 10.

	Level of Preference										
	Least										Most
1. Sell **weaned calves**, at **auction**, and **willing** to meet buyer requirements	1	2	3	4	5	6	7	8	9	10	11
2. Sell **weaned calves** by **direct sale** but **not willing** to meet buyer requirements	1	2	3	4	5	6	7	8	9	10	11
3. Sell **backgrounded cattle**, at **auction** and **willing** to meet buyer requirements	1	2	3	4	5	6	7	8	9	10	11
4. Sell **weaned calves**, at **auction**, but **not willing** to meet buyer requirements	1	2	3	4	5	6	7	8	9	10	11
5. Sell **finished cattle**, at **auction**, but **not willing** to meet buyer requirements	1	2	3	4	5	6	7	8	9	10	11
6. Sell **weaned calves** by **direct sale** and **willing** to meet buyer requirements	1	2	3	4	5	6	7	8	9	10	11
7. Sell **finished cattle** by **direct sale** and **willing** to meet buyer requirements	1	2	3	4	5	6	7	8	9	10	11
8. Sell **backgrounded cattle** at **direct sale** but **not willing** to meet buyers requirements	1	2	3	4	5	6	7	8	9	10	11
9. Sell **finished cattle** at **auction** and **willing** to meet buyer requirements	1	2	3	4	5	6	7	8	9	10	11
10. Sell **backgrounded** cattle at **auction** but **not willing to meet buyer requirements**	1	2	3	4	5	6	7	8	9	10	11

If you wish to receive a summary of the results of this study, please provide following information.

Name: .....

Mailing address: .....

.....

THANK YOU FOR COMPLETING THE SURVEY

PLEASE RETURN THE COMPLETED SURVEY TO US BY APRIL 20th IN THE PRE-PAID ENVELOPE PROVIDED

Appendix B

(A Cover Letter)

THE FUTURE OF THE SASKATCHEWAN BEEF INDUSTRY

Dear Sir / Madam:

This survey is being sent to a random selection of beef producers (cow-calf. background, and feedlot) in Saskatchewan and you have been selected as one of them. As the markets for beef become increasingly global and thus increasingly competitive, it is important that the Saskatchewan beef industry take stock of where it is at and where it is headed. In completing this survey you will be helping the Saskatchewan beef industry plan for its future. We estimate the survey will take 15 20 minutes to complete.

Please return the completed questionnaire in the enclosed stamped addressed envelop by April 20th, 1999.

You have the chance to win one of six prizes, each worth about $50 if you return the completed survey questionnaire on or before the above date. The answers given in the survey will be used in confidence and will not in any way obligate you in the future. It is being carried out under the Advisory Committee on Ethics in Behavioral Sciences at the University of Saskatchewan.

Your cooperation in completing the survey is greatly appreciated. Returning the completed survey will be considered as your consent to participate in this study. If you wish to receive summary of the results of this study, please provide your mailing address in the space provided at the end of the questionnaire. If you have any questions or concerns about completing the survey, please contact us at the telephone number listed at the bottom of this page and one of us will return your call at our expense.

Thank you for your participation.

Prof. John Spriggs

Prof. Gary Storey,

Hemal Kularatna